





COLLECTIONS MADE BY CHARLES A. ROSS

The following collections were used in Charles A. Ross' 1965 Journal of Paleontology article "Late Pennsylvanian Fusulinidae from the Gaptank Formation, West Texas" vol. 39, p. 1151-1176.

Section 26, bed 2 (26-2)	30-3	31-3	32-1*
26-8	30-6	31-8	32-11 (2 bags)
26-10B	30-10	31-13	32-12
28-1*	30-19		32-16 (?3 bags)
			32-16 (=7-16-57-loc.7 (not 7-17-59-loc.7 & not <u>6753</u> (Leonard?))
*Not included in study - probably lacked fusulinids.			
34-15	36-4	37-1	<u>6755</u>
35-6	36-6	37-9 (8-20-57; 6683	
35-7	36-7	37-9 (float)	
35-10		37-11	
		37-12 6683	

The publication locates the collections quite well. These samples were retained by Charles Ross from the main samples for future reference. They are part of YPM accession 6683

Charles Ross had a note to me that he was still tracking 37-36b which may be from the lower part of the Hess facies. He was also trying to locate the source of samples 8-31-66-J and 8-31-66-0 and -Q; probably southeastern Arizona.





doc 315

doc 315  
- 2-12

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doc. 315

C.A. Ross 1957, 1958, Measured Sections and Notebook Pages (accn. 6683)				
Publ. Sec. #	Doc. 315, pages	Doc. 316, pages	Orig. Field Sec. #	Field Map #
1		5	24	
2		23	28	
3		20	27	
4		12	26	
5		10	25	
6	120		18	
7	128		19	
8	7, 8, 135, 143	96	20	
9	155		21	
10 (upper part)		154	42	
10 (lower part)		156	43	
11		159	44	
12		62	35	
13		65, 86	36	
14		69	38	
15		67, 104, 126(not in Pub Sec)	37	
16		121	40	
17		72	39a, 39b	
18		89	41	
19	56, 67		7 (VII)	
20	40, 45		V	
21	49		VI (sec 1/2 way bet. V & IV)	
22	29, 38	32	IV	
23	23		III	
24	19		II	
25	16		I	
26	71		8a, 8b (skeletal)	
27	75		9	
28	86		12	
29	76	150	10	
30	80		11	
31	90		13a, 13b	
32	101		15a, 15b	
33	Udden, 1917, & King, 1931		none	
34	97	163	14a, 14b	
35		56	33	
36		39	29	
37		52, 124-127, 169	32	
38		43	30	
39		48	31	
40	107	137, 140	16	
41	114		17	
42		2	23	
43	King, 1931		none	
none	157	129	22 (not on publ. Map)	
none		34, 58	34 (not on publ. Map)	

doc. 0315

C. A. Ross

Peabody Museum  
Yale Univ.  
New Haven, Conn.

FIELD NOTES

Book 1


Marathon, Texas, Summer 1957

Study of Wolfcamp Hills and  
Wolfcamp sediments along S. front of  
Glass Hills. -

C.O. Dunbar visited <sup>me</sup> in the field  
on the 22, 23, 24, and 25<sup>th</sup> of June, 1957

Also Gaptank Localities

1668

 = thesis +/or publ. sec. #

Doc 315 + 316

orig. field  
sec. II

doc 513

I

II

III

IV

V

VI

7 (VII)

8 a, b

9

10

11

12

13 a, b

14

15 a, b

16

17

18

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39 a, b

40

41

42

43

44



doc. 0315

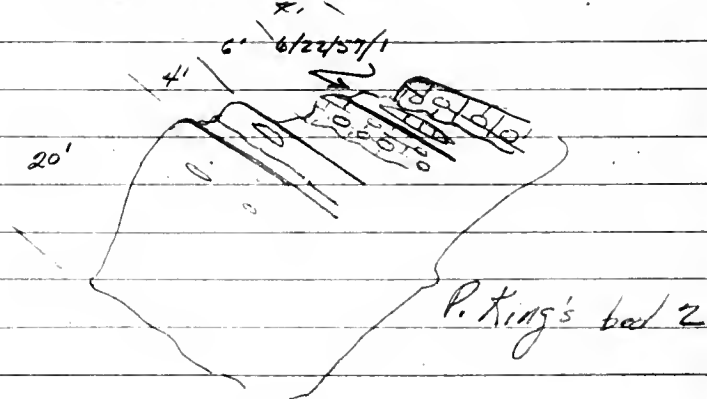
(Neal) Taylor Ranch - Wolfcamp Hills - Sunny - Warm.

6-22-57

①

②

Collection - 6-22-57-1 - upper of P. King  
bed 2 - point over Geologist Canyon - 200 yds  
N. of Uddenites Saddle.



Collection 6-22-57-2 - From about middle of  
P. King bed 4 - 100 yds east of east turn of Creek  
Geol. Canyon



(2)

Hess is a ls sequence and under lies the Leonard which is siliceous.

The Leonard just beneath the sill and top of Wolfcamp is Calcareous, & often very silty - well bedded. The Hess Conglo. is "white"

The western part of the Wolfcamp looks like a good place to measure the Hess Conglo. and to determine to fusulinid sequence in the Lower Hess (or Leonard). Check this section against the Conglo. sequence on the north fork of Geoli Canyon. Question to think about: what is the nature of the cyclic deposition of the Wolfcamp sequence. The limestones start off with rubble and then go up through clastics which become finer and finally are present as finely laminated sand (siliceous). These laminae are similar to the individual sets of beach deposits in Lyons ss. What caused cycles? what conditions changed to cause deposition of Hess Conglo. & Leonard silt + clastic beds.

C.O. Dunbar & I drove around east end of Hills and got back side - road not so good. Walked the eastern exposure of the upper Wolfcamp (Peking beds 4 to Hess Conglo.).

(3)

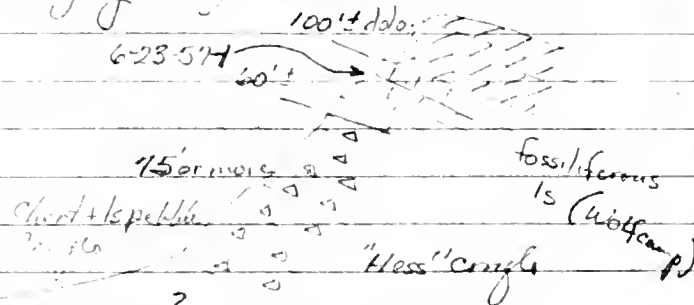
The fauna needs to be studied from various points along the section bed for the following circumstances: Reef nodules found in great abundance on P.K.'s bed 9 to 12 - this cause uneven, distorted, ls. ledges spread across result of differential compaction.





Cool in Morning, Sunny, some haze - dusty and  
 hot in afternoon. Regional showers in late  
 afternoon.  
 6/23/57 -

Went to Hess Ranch and to spur of  
 ridge around which Road winds -  
 C.O. Dunks explained section to top of  
 Ridge roughly as follows:



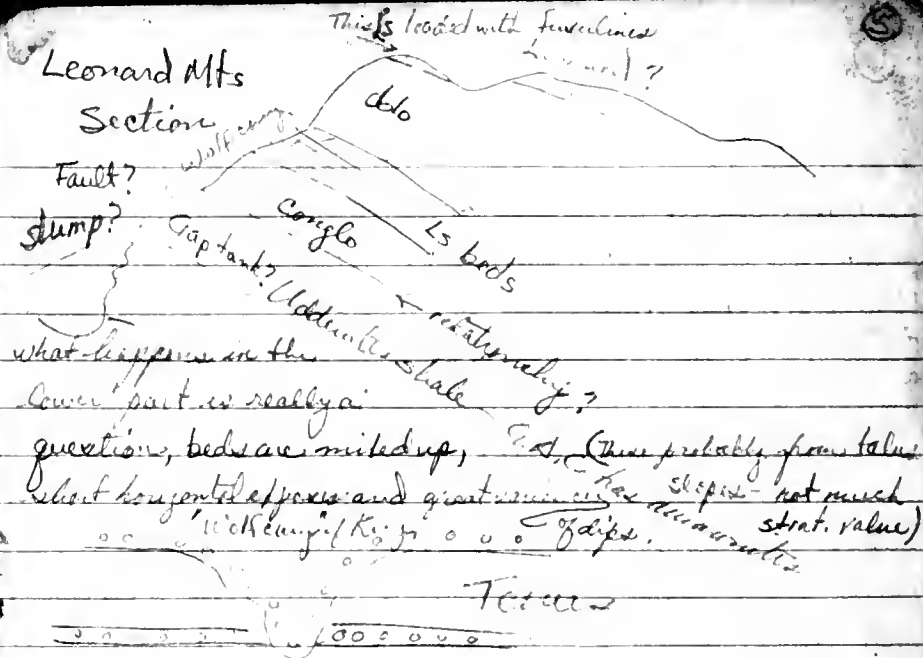
The age of the dolo is questionable - The  
 "Hess" congl. has Wolfcamp fossils over  
 lying it - so that the congl. is apparently  
 one of the Wolfcamp series

The possible correlation of the above section  
 with that of Leonard Mts needs to be definitely  
 worked out.

6-23-57-1 - Spur above Hess Ranch House - just  
 east of fault, about 15-20 feet below <sup>base</sup> "big dolo" ledge  
 (about 10' below "rusty" layer).

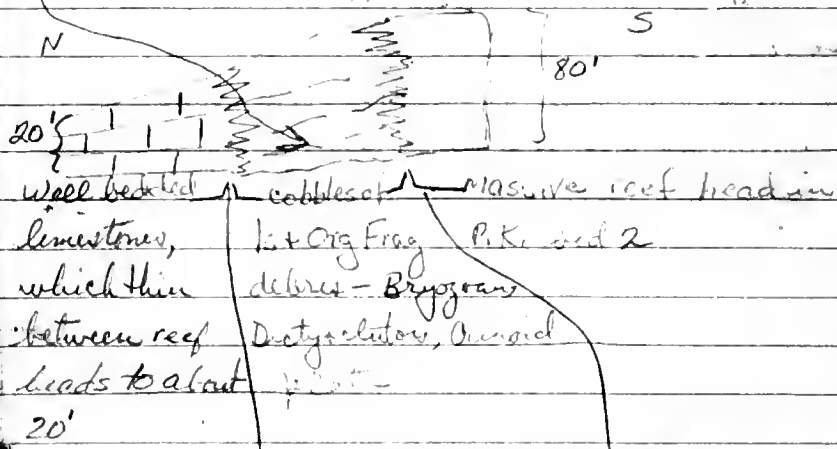
## Leonard Mts Section

Fault?  
 slump?



Uddenites Shale - east side of geol. canyon  
 6-23-57-2.

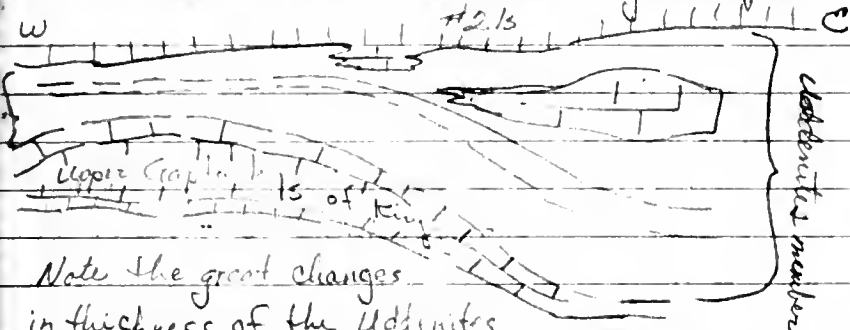
6-23-57-3 - West flank of <sup>water</sup> main Resynole  
 in P.K. limestone 2 due North of Neal Ranch.





⑥

Uddenites zone - Brown weathering material in  
ls - what is it? Section along face of Mid Hills



Note the great changes in thickness of the Uddenites shale - The contorted bedding of the <sup>upper</sup> Gaptank ls, the biohermal nodules and variation in thickness of other beds - Trace these out and try to find out if the Uddenites member is only a facies, a time unit which may have been deposited as the Gaptank was being deformed, time of deposition - what is structure of these? Joints? What about joints about the draped limestones over the higher biohermal developments?

8 (part)

⑦

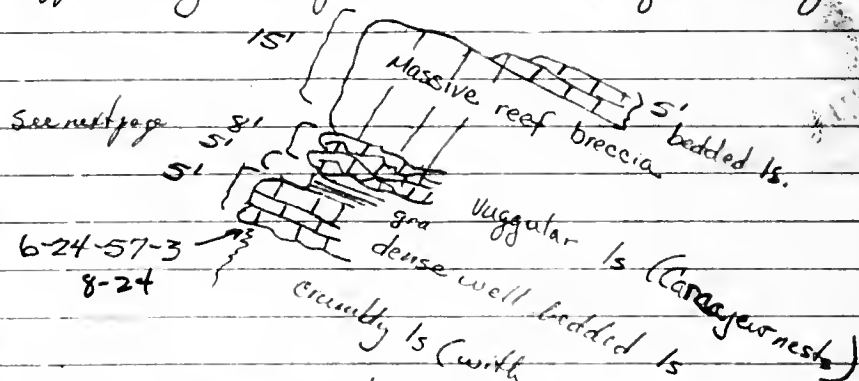
## Sect. 8 (part)

6/24/57

[see p. 135 + 143]

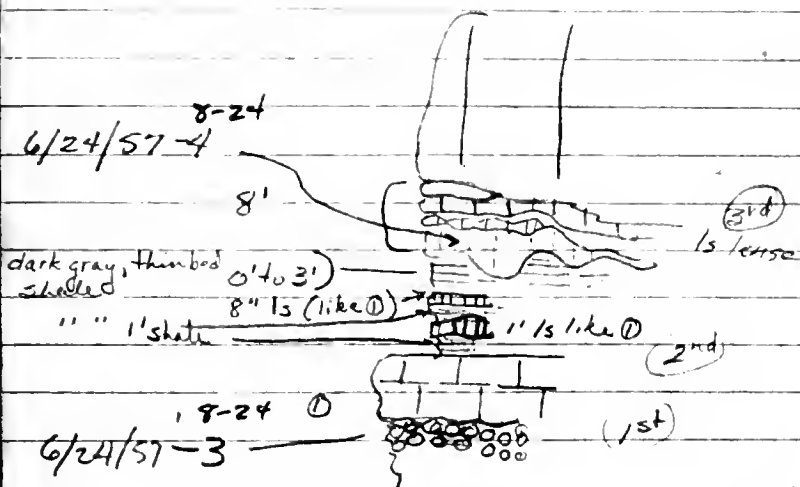
1st limestone ledge about 80' above top of Wolfcamp Congl. in section Karajew nest in Lower Hill - ref. CO.D 6527/34 collection  
6-24-57-1 is in same horizon as this - 8-12

6-24-57-2 - From same section as -1; This is from a large block of ls. 3' x 2' in the Hess ledge - The ledge itself is a Sacchinella - Leptodotes reef with red boulders of various rock types in it. This block from which this sample is taken is apparently on edge in the rubble of this reef.



The exact base of the Hess is questionable here - any of these lower 3 contacts would be acceptable.





- ① a gray ls with fine to med pebbles, and abundant crinoid stems and shell fragments.

The fusulines in -4 are possibly weathered out from lower limestones and redeposited in pockets in the reef facies. C.O.D. believes these are at least superficially similar to those of collection -3.

The contact between the massive cliff forming and the underlying could be either a cut surface or a deformed surface. The way the lower ls units in the siltstone lense in & out would suggest a facies change and not a great unconformity right at the base of the Hess ledge.

Collection 6/24/57-5 - at the base of Upper Hess ledge, 250 yds S of gully 1<sup>st</sup> bench which flows down Carcay section. unit 53, Section 8

Collection 6/24/57-6 - a fossiliferous 8-37 lense in Hess which is 1/2<sup>1/2</sup> fuscon lss (80') above the basal Hess sacchinella ls. This is interbedded with the siltstone, sandstone (CaCO<sub>3</sub>) iron-chert stained.

Collection 6/24/57-7 - slabs of a fusuline & shell chockina - 45' above top of Lower Hess sacchinella ls reef at Carcay section



⑩ Gaptank type area Clear + Sunny

~~loc 1~~  
6/25/57-1 - Collection from a limestone within the upper Gaptank Congl of P. King on or close by to the type section.

~~loc 1~~  
6/25/57-2 - Collection on <sup>NE</sup> back slope at top of P. King <sup>congl</sup> above Gaptank <sup>unit</sup>.

~~loc 2~~  
6/25/57-3 - 10' above Collection 2 - 6 or 8 feet of brownish weathering nodular ls with interbedded yellowish shale - beds above are sandy (brownish-red)

~~loc 3~~  
6/25/57-4 - about 80' above collection 3. In what we believed is P. King's #1 Gaptank ls - (this maybe has #2 ls in it) This is #2! Light gray to white ls, with occasional light yellow patches.

~~loc 4~~  
6/25/57-5 - near top of P. King's #3 ls - In one of many gray ls shell chachines. This slope has some coarse fragments with which are included in collection.

~~loc 5~~  
6/25/57-6 - 10' to 15' below base of P. King's #4 Gaptank ls. - in a brown + gray weathering ls.

⑪  
~~loc 7~~

6/25/57-7 - collection taken at base of what we believed is P. King's #5 Gaptank ls. -

Drove C.O. Dunbar to Monahans to get Santa Fe for Dallas.

C.O.D. seemed pretty convinced that the Gaptank is Canyon in age and not Cicer. Suggested that Uddenites might be a Cicer equivalent and he said yes that was what the fusulinids occurred to. He didn't know whether the #2 ls of lower might not also be Cicer also. The problem of the conglomerate pebbles in Cicer ls came up again. There is a good point - Ref. to Australian paper might be good here.

C.O.D. wants more collections from the upper Gaptank - type locality, also a close study of the Wolfcamp and Uddenites zone in that region.





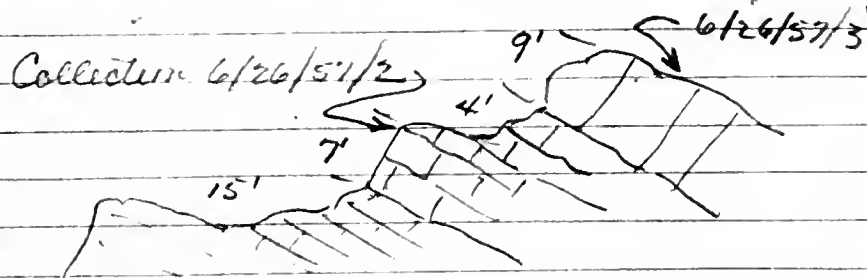
⑫ Wolfcamp Hills - east end.

6/26/57 -

Studied the "Dolomite" sequence at east end of the hills - The easternmost ridge is composed of ls, the dolomite if present is limited to one or two narrow bands. The ls is a massive to typical biohermal deposit, very large amount of crinoidal debris and bivalved shells, a few echinoid spines. Trilobites are few and are rather coarse even in what appears to be scabrous.

Collection 6/26/57-1 is from a smooth weathered ls band about 8" thick within the upper 2' feet of the massive face forming ls. This is overlain by about 2' of unevenly bedded ls and dolomite. The top of the massive ls and the unevenly bedded layers is S70E.

Much of the slope to the SE of this narrow ridge appears to be rotated and sheared. The liddinites beds are off-set.

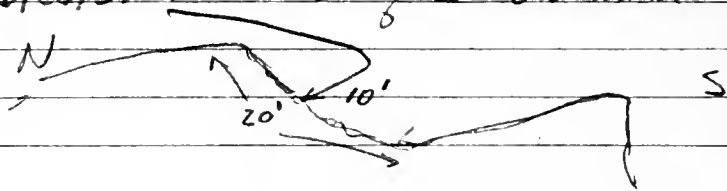


⑬

This collection (2) is from the 2<sup>nd</sup> ls highland from the eastern end of the Hills. The pocket from which these fusulines came is rather thin but of considerable horizontal extent. The stratigraphic interval between 1 & 2 appears to be only about 12' above collection 6/26/57-1, but the relationships are obscured by discontinuous bedding and rubble of these 2 biohermal masses.

6/26/57/3 - From the highest portion of the 2<sup>nd</sup> bioherm on the east end of the Wolfcamp Hills. This collection is about 13' to 15' feet stratigraphically higher than (2).

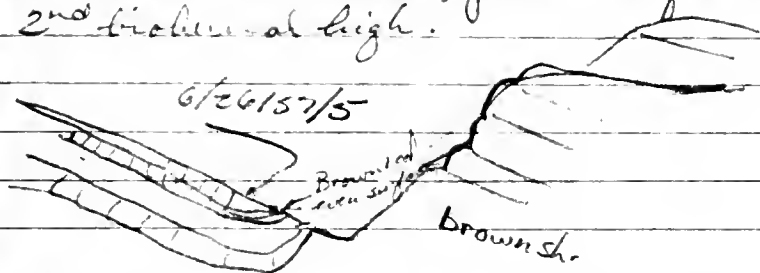
6/26/57-4 west side of 2<sup>nd</sup> biohermal ridge.





(14)

6/26/57/5 - Collection is from uppermost ls ledge in what will be tentatively called the Uddenites Member, just west of the 2nd bioherm at high.



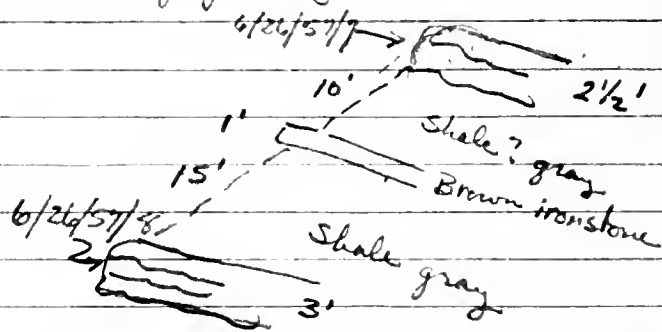
6/26/57/6 - This is collection from a fossiliferous horizon in brown-yellow weathering band at the base of the <sup>apparent upper</sup> Uddenites ls bioherm (near the middle of the eastern sector in a wind gap.)

6/26/57/7 Collection from Uddenites zone, 100 yds S of western end of dirt embankment at End of Wolfgang Hills. The 12/15 bioherm of King has beds dipping away and at this point and many blocks of these ls have slipped down to cover the contact. This Uddenites bed is high in the zone and is a gray nodular ls with embedded brown & rust weathering vixetrous. The calcite in the original rock has been recrystallized, probably as a result of the fracturing.

(15)

flexure at this end of the hills, lowering the eastern side.

6/26/57/8 - Collection from brown weathering brachiopod and juvenile coeloceras ls, about 25 feet stratigraphically below 6/26/57/7.



The east of the Hills are going to present problems in covered intervals and erratic discontinuous deposition.



①6

6/27/57 Section 25 - (This was one bed of aMeasured Section: ISa 25

S 154° E to station on road at Neal (Taylor) Run

S 85° E at turn east of Road

Gap tank

1.) Covered below

2.) Ls, weathering to yellow brown, a shell  
black & brachiopod and fusuline frags;  
5 1/2' Collection 6/27/57/1 (day 10)3.) Covered, probably shale which weathers  
gray brown, 3' 1'4.) Ls, gray to green weathering, lower portion (2')  
3 to 4" ripple beds, upper portion in  
medium to 2 to 4" thick. Thin bands of  
interbedded brown shale - 12', organic fragments.  
Collection 6/27/57/2

Top Gap tank

5.) Covered - 5' 1' probably? Shale with a  
few small <sup>rusty</sup> limestone layers, no definite  
bedding could be detected6.) Ls, brown weathering, Crinoid fragments  
a section in some pocket of fusulines  
are present - 5' the upper portion of  
this section has black ls pebbles in it,  
but have no fossils.Collection 6/27/57/3 - one block which  
contained a good fusuline fauna - maybe  
from higher in the section

①7

hot day!

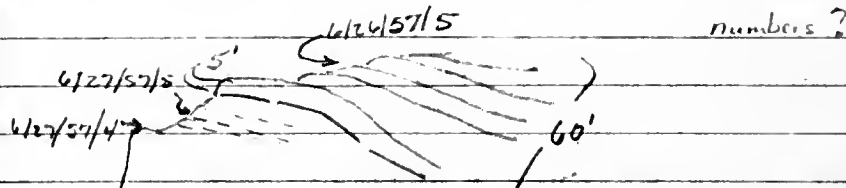
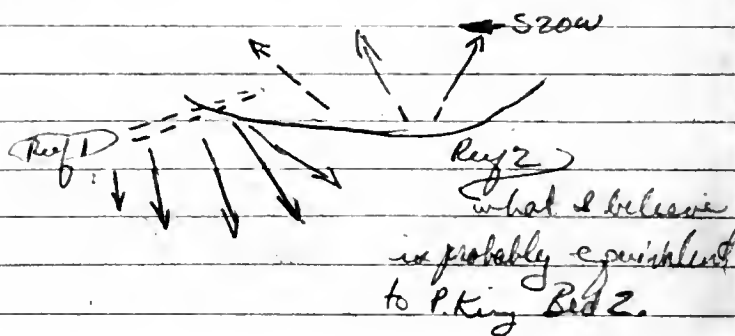
7.) Covered - probably shale 52'

8.) Ls. gray, weathers light brown, lower 11'  
are rubbly becoming better bedded into  
undulation 3 to 4" layers: clays 13' massive  
in 2 to 4' beds, biohermal ls.The shell fragments are dominantly brachiopod  
& crinoids total 24', Collection 6/27/57/4

9.) Covered, 5', probably a weak ls.

10.) Ls. brown weathering, slightly sandy  
7', Collection 6/27/57/5

11.) Ls, gray to brown weathering 5 - 60'

The upper surface of #11 unit has a 1/2"  
limestone stain on a relatively recent exposed  
surface -



(16)

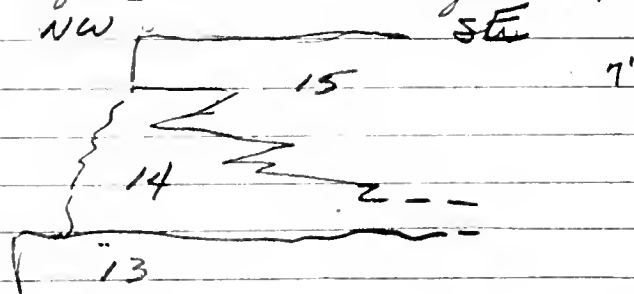
The junction of Reef 1 precedes that of Reef 2 and the debris from reef one sloped toward the SE. The relations are not completely clear but the debris from Reef 2 appear to rest on the truncated edges of reef one debris, suggesting that Reef one had a great extent to the NE but was removed by sea level rise some time in distance.

Uddenites  
Top of 12) Covered 27' probably soft ls.

13.) Ls. gray weathering, a bischornal hash. 17', in 4 to 5' massive beds.

14.) Ls. nodular, <sup>dark</sup> gray, weathers to white. 5 to 25'

15.) Calcareous, yellow weathering - Cape (14) but intertongues with it NW SE



16.) Ls. yellow-buff weathering - 20 ft. collection 6/26/57/4 is from this interval - Top of Ridge -

24

## Section 24

(19)

Section II about 200 yds SW of section I

1.) Shale, dark brown, bottom of interval not seen, top not seen, estimate 100-125' feet thick. Collection 6/27/57/6

[Gaptank shale is considerably thicker here than at type?]

2.) Ls, dark gray, <sup>15</sup> rubble at base 8', massive ls ledge 3' (Collection - 6/27/57/7) at 33' above base of 1st ledge - collection 6/27/57/8

This unit becomes progressively more shaley in the upper part. Total thickness of this unit is 74'

3.) Ls., gray, brownish yellow weathering - indistinct nodular bedding in lower 8' part of this unit.

Collection 6/27/57/9 at base - 33' massive ls with one 2' band of nodular ls about midway in unit - Total thickness 41' -

The upper part weathers gray on top.

Top of Gaptank - Base of Uddenites

4.) Covered 12', probably brown shale

5.) Ls, light gray with interbedded brown siltstone - Crinoidal hash. 5' occasional brachiopod frag.





- 6) Covered - 9', probably gray shale and a few brown siltstone bands -
- 7) Ls, brown weathering, bedding 6", uneven surfaces, Crinoid, brachiopod and a few fusulines. Collection 6/27/57/10 24-7  
8'
- 8) Covered - 12' probably lime nodular in a clay or silt, some brown colors -
- 9) Ls, gray, massive -
- a) fusulines and brach. coquina in a 6" band at base, Collection 6/27/57/11 (same horizon as 6/26/57/6)
  - b) Massive ls. layers 4 to 6' thick - these join the dip slope and seem to be about 10' below what I believe is P. King's ls #2 bed.  
12' thick (?)

In the afternoon of 6/27/56, I drove NE from the Wolfcamp hills to a tank (about 1.5 miles). From there I walked slightly west, north to the Cow outcrops of the Wolfcamp. These are mapped by P. King, just below the Newburg. I found silt and sandstones with even bedding ~~there~~ exposed in a gully. They would suggest that the congl. near at Wolfcamp hills is only a local bed or lens. The sandstones are med. lenticular -  $\frac{1}{8}$  to  $\frac{1}{16}$ " and have abundant tube (or fecal castings) of worms - one I measured was 5" long,  $\frac{1}{4}$ " in diameter and near straight -

- About 2' above this silt & sandstone sequence - the rubble part of the ls. I made Collection 6/27/57/12.

It looks like what C.O.D. said Schenckville might look.

- 4' above collection 6/27/57/12, I found a brown shale - it had a few streaks of red-brown at the top and some gray in patches - Collect 6/27/57/13 from shale.



(22)

At this time I'm not too sure of the data, but the deal about shifting and looking reefs maybe a partial answer to the big picture. Perhaps in well logs we could get the needed 3D perspective on the facies shifts.

After briefly looking at the lower Hess, I wonder at what silt, sandstones, and cemented siltstones, with a few interbedded ls. might mean with relation to the cyclic wofcamp and the irregular and peculiar Uddenites zone.

The ~~phase~~ phases of the biohermal growth in the wofcamp must have had other types of deposits elsewhere - could they not be represented on either the Uddenites facies (no because of fossils?) or the lower Hess (which is not well known generally).

The Hess section I saw in the afternoon needs to be restudied in greater detail.

The massive cliff formation in the Hall is probably all Hess, but King reports some wofcamp and so the face of the hill needs to be studied.

23

Section 23

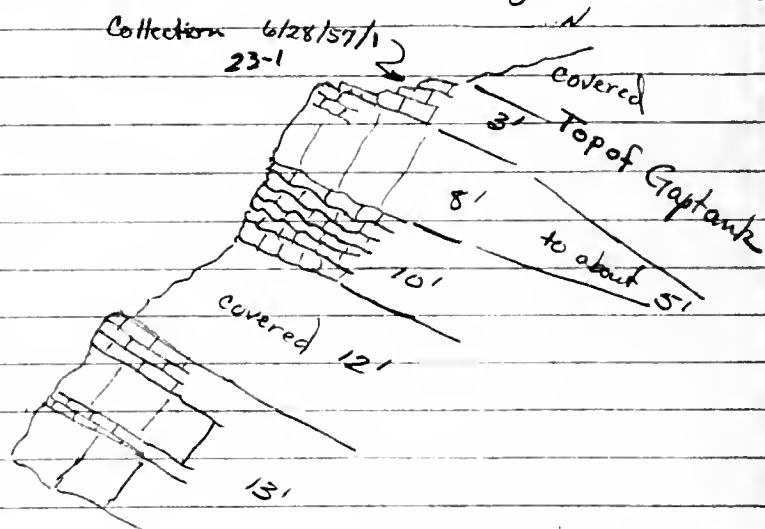
(23)

6/28/57 23 Near Center of WCHs -

Section III in a line N30W of Taylor (Neal) Ranch

1) Upper Gaptank ls - same unit as 3 in section II.

Here it is less massive, about 8' feet, with the middle nodular zone of unit 3 in Section II thickening up to at least 10', about 12' more is covered and it looks as if the lower massive zone of unit 3 Sect. II is either missing or is nodular here. The upper 2 to 3' is a nodular ls. in 6 to 8" layers - becomes sandy





(24)

2.) 34' covered - probably a gray shale -

3.) Ls, brown weathering, gray on fresh surface - This is a organic cemented rock - of brachiopod and a few coral frags. The lower bedding surface of this unit contained patches of greenish blue. Collection 6/28/57/2 3'

4.) Covered internal - 23'

5.) Ls, yellow brown weathering, in beds 4 to 8", Crinoidal + greenish calcina lines, 50' to the west the unit became massive and composed only of crinoidal fragments. Collection 6/28/57/3 is from base of this unit.

Collection 6/28/57/4 taken 20' above base of this unit.

The upper part of this unit became massive and is probably a bioherm. It tapers off in both E & W directions into thin beds at the top of the western bioherm and the beds at the base of the eastern bioherm, 33'

6.) Covered - 8' probably gray shale - thickness to 12" but this depends whether it is between bioherms or at the top of one.

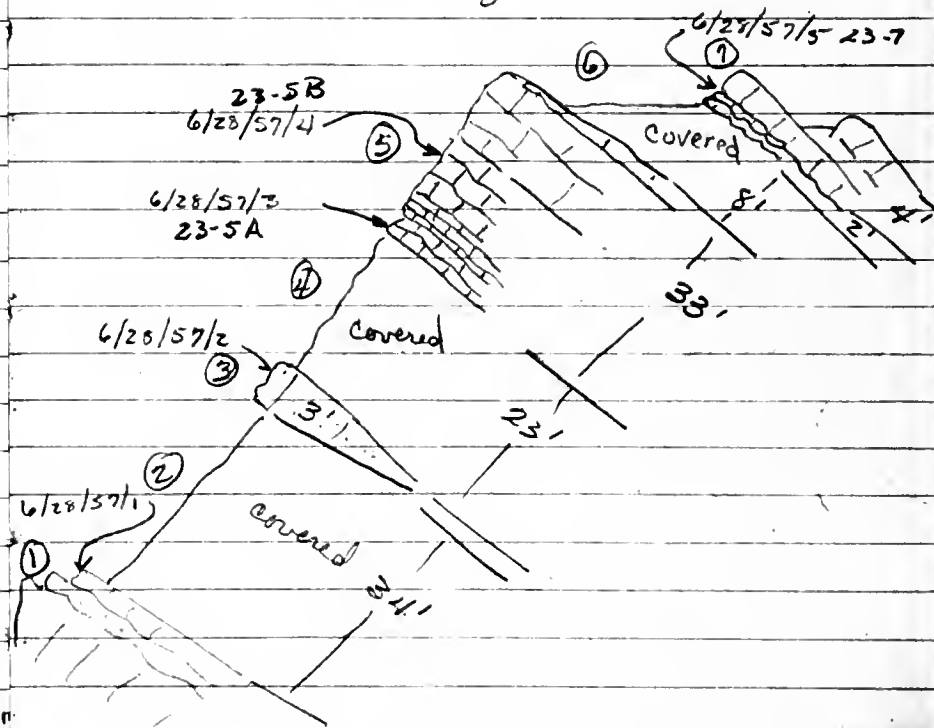
(25)

7.) Ls, gray weathering, I take this to be the base of P. Kings #2 ls.

This is a fine grained calcarenite at this point. The 2 feet of rubble material below the base of the unit has a greenish fauna (Collection 6/28/57/5)

4' thickness of unit

- eroded surface -

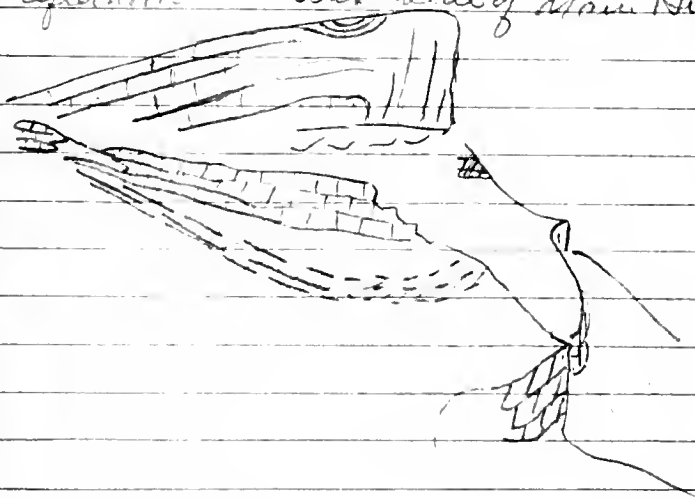




Collection 6/28/57/6 from a <sup>weathering</sup> brown biohermal ls. in the Uddenites zone. This is approximately midway between the base of King's #2 ls and the top of the Gaptank ls. -

The Uddenites zone is badly covered here - This section is in line with the road down to the Ranch House S55°E, I estimate the thickness to be 85 to 95' - The outcrop from which collection 6/28/57/6 is about 8'.

afternoon west side of Moon Hill



The outward appearance of this is quite misleading. The Gaptank ls. forms an anticlinal structure under the western bioherm of the main #2 ledge - The Uddenites zone and a part of the biohermal reef have slipped <sup>950' unit</sup> down over the lower Uddenites shale bedding planes. The mass now rests in a structural valley of the Gaptank fm. The eastern side has moved the furthest with about 175' of displacement; the western end is more or less hinged about a point.

Collection 6/28/57/7 - about 6' below top of Gaptank fm - east side of geologists' Canyon -

On the east side of geologists' Canyon, the "window" which C.O.B. pointed out on the first day is most confusing. I have some doubts as to whether it really is a "window" structure. The Gaptank does some fancy folding at this locality and it seems that the Uddenites zone is missing and the #2 ls of King rests directly on Gaptank ls.





The Uddenites zone as present is only a foot or so thick, but probably is represented by little more than an erosional bedding plane. The fossils present are dominantly Crinoids and a few Trachigaster and are now sand chert or siliceous. This area is quite important and it will pay to study the fauna as carefully as possible to determine age relationships. The Dip and questionable faults also may have some importance on the regional structure of the Late Penn.

6/29/57 - Drove to Alpine and got a haircut and the brakes tightened on the car. Did some banking for Mr. Jellis also.

Sent 2 bags of rock specimens to Peabody Museum on this date also. Railway Express - COD - 100 lbs total

6/30/57

[See p. 38, + p. 32 of Nb 2]

## Geologist Canyon - Section IV

Collection 6/30/57/1 - P. King's gray ls (#2 bed) in creek floor

Covered below

- 1) Ls, grey weathering 6" to 3' beds, most crinoidal fragments + some other organic fragmental matter. 3'

The upper portions of this unit have progressively larger boulders in them. Most of the upper 6 to 7 feet is composed of ls cobbles 3" in dia. in a ls matrix. The uppermost foot contains the large ls cobbles. The few pebbles found on the upper bedding surface are about 1" in diam. (6/30/57/P is from the lower 3' of this unit.)

Collection 6/30/57/2 is from upper 3' of this unit.

2. 8' Covered - probably gray shale

Collection 7/1/57/10

- 3) Ls, congl. 1/2" to 2" diam. pebbles, well rounded, little gray chert pebbles - some crinoidal stems, a productoidae - <sup>Brown</sup> yellow weathering

Collection 6/30/57/3

4'



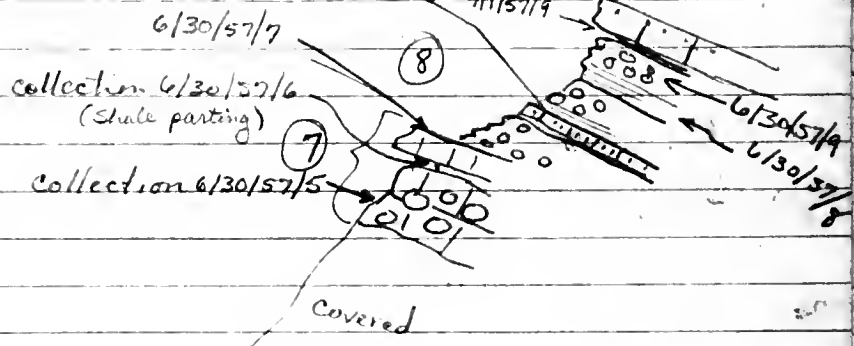
4) Covered 7' black to bluish shale in lower part.

5) LS, congl yellow-brown weathering, upper 1' is sandy and organic fragmental. Flat bedding plane on top.

Bryozoans, fusulines, crinoids common on upper surface. Collection 6/30/57/4  
3 1/2'

6) Covered. 44' one or two 4" to 6" brown weathering sandstones are probably interbedded in a shale (gray?)

7) LS, congl + rubble at base grading upward into organic fragmental and finally a sand layer (well laminated) in the uppermost 3 to 4". There is apparently a shale parting between the rubble-congl portion and the organic fragmental-sand portion. Typical flat top bedding plane.  
(6"?)



8.) 2' - of which the lower 1' 8" is a rubble of crinoid parts - upper 3" fine grained, laminated sandstone (CaCO<sub>3</sub> + much silification) - a 1" shale parting separates these litho.

9.) a.) shale grey - grading into crinoid chockina and 1" diam pebbles which forms a rubble - 2 1/2'

b.) Repetition of 9a 1 1/2' followed by shale parting 1"

c.) fine coquina grading upward into a coarse ss, laminated w/ flat upper surface 2'.



10.) Covered 30' - brown to gray shales probably

11.) Ls, orange brown weathering - another cycle - like unit 5 or 7

4' Collection 6/30/57/10 in top portion of unit 11

12.) Covered 13'

b) Thin 4" brown silty fine calc. ss. size in ss.

c) 10' covered

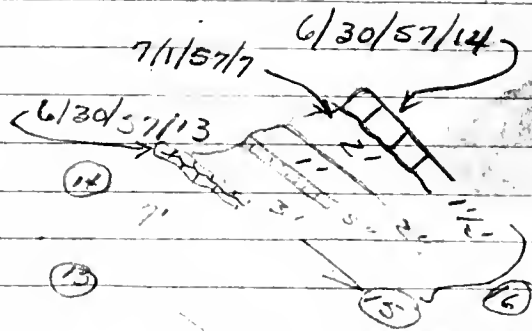
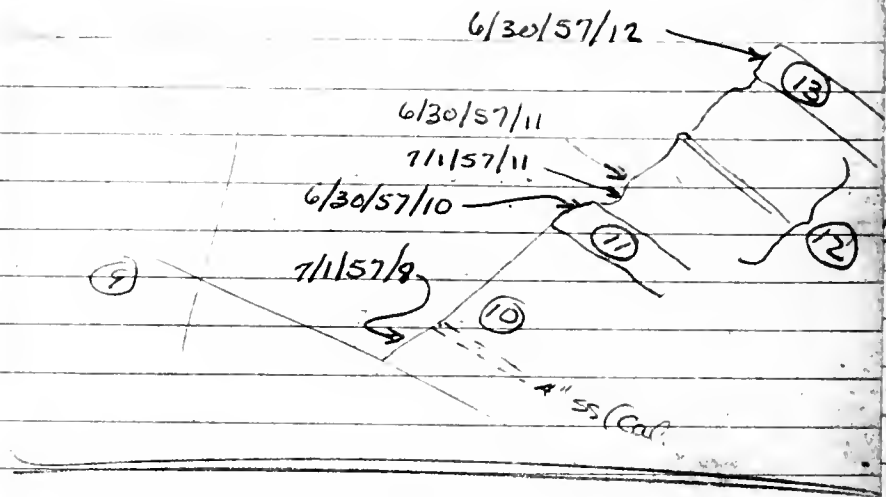
13.) Orange brown - calcareous - fine grained planar upper surface - no rubble 2nd layer observed.

Top of 13 6/30/57/12

Top	
3"	fine ss lamellar
2"-3"	reworked shell zone
4"-6"	lamellar shelly zone

14.) Covered, 1'

15.) Ls, brown yellow weathering, irregular bedding, but with 1" top zone of fine ss nearly planar 6"





- (16) a) 3' gray shale  
 b) 5" brown calcareous bed  
 c) 1' gray shale  
 d) 2" brown calcareous bed  
 e) 2' gray shale  
 f) 1 1/2' calcareous sandstone

This is a typical top sand and rubble ls -

17) Covered - 25' gray shale?

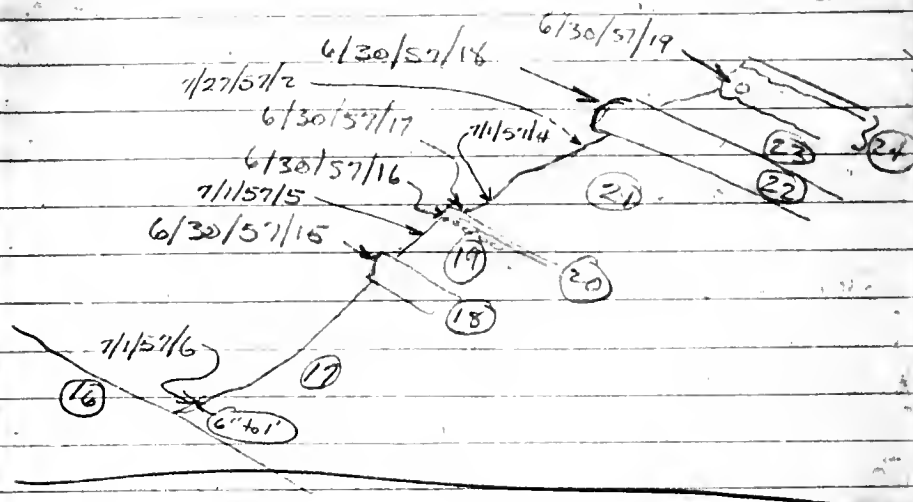
18) Ls., the typical planar <sup>top</sup> surface and shell calcareous bed - 2' total  
 Collection 6/30/57/15

19) Cover 7' shale?

20) Ls. w/ some chert pebbles - Brown weathered and not so yellowed as most.

A conгло (pebble) at base of this is.  
 Collection 6/30/57/16 (6")

The fine grained sand (calcareous)  
 is Collection 6/30/57/17 (4")



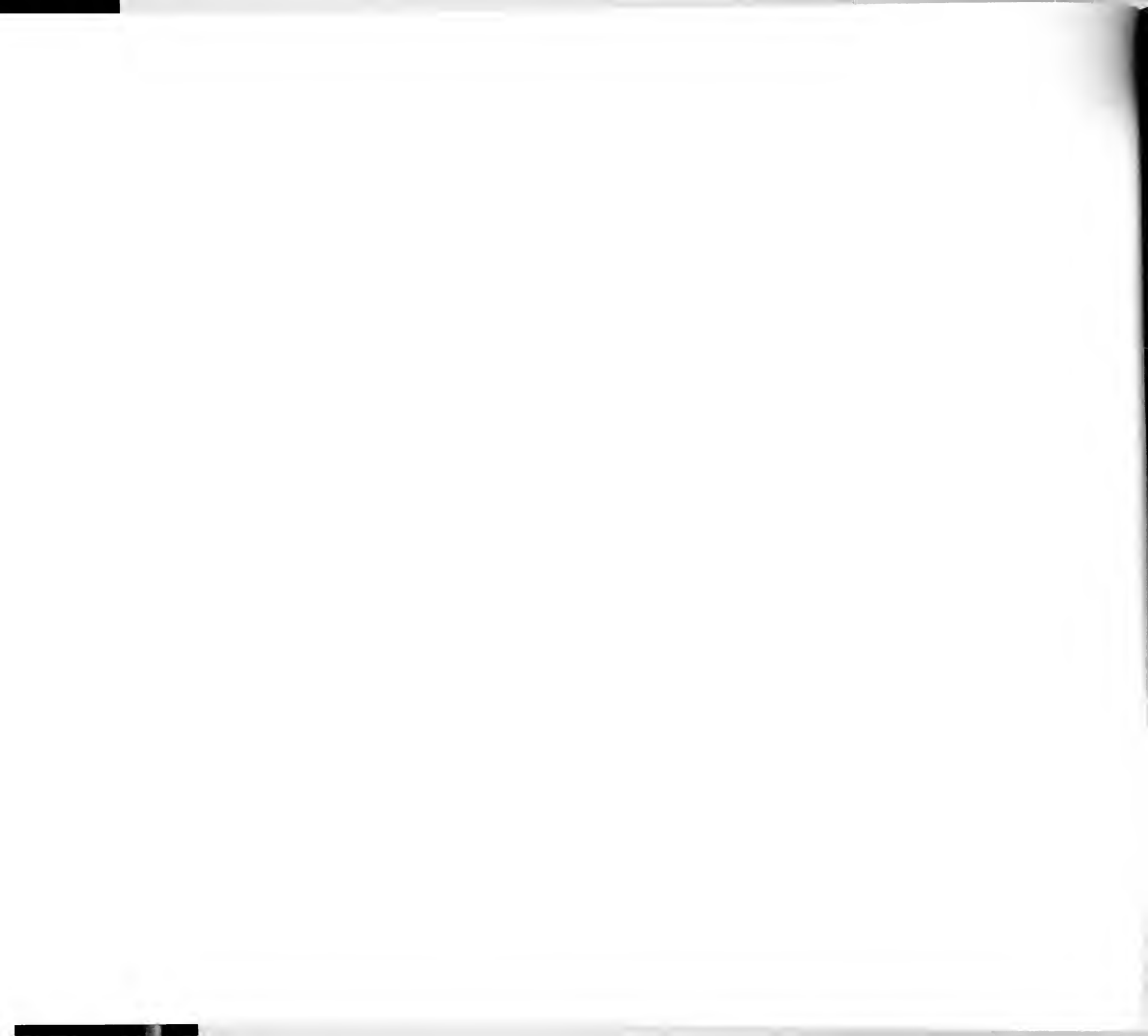
21) 17' covered, shale with fine sand, laminated  
 - with sandstone -

22) Ls. yellow-brown - fairly massive - thin  
 2' to 3' thick. Some 1" diam. pebbles (nearly black ls. Collection 6/30/57/15

23) Cover - probably gray shale - 8'

24) Ls. brown-yellow, orange like cyclical  
 type - lower rubble zone is 3'  
 upper planar zone (5') is 6"  
 Collection 6/30/57/19





25.) Covered 16'

be brown ss much like 12b, w/ small crinoidal stems.

c) shale 12', w/ one 3" brown ss band like 20

26.) Ls. & weathering, shale beneath - 1 1/2', sample 6/30/57/20

27.) Shale, covered in part, 3'

28.) Ls, orange-brown, few fossils 1 1/2'

29.) Shale, yellow to orange with a few siltstone layers. - 22'

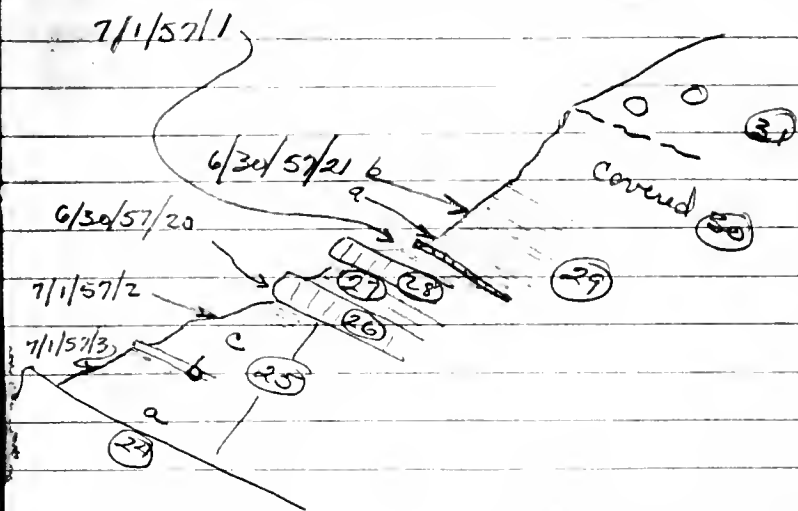
Collection 6/30/57/21 (a+b) 2 sacks

Brown weathering ls - sand near base

30.) Covered 11' probably more of 29 shale ± 266'

31.) Ness Congl.

Continued, bk 2p. 32





7/1/57 -

[sep. 29 + p. 32 of 1162]

Took shale samples from Section IV

7/1/57/1 to 7/1/57/11 as marked on Section IV

7/1/57/12 in Lower 20' of Basal Mass. There  
 are cracks in the shale. There are also  
 some fossils in determining source.

7/1/57/13 Sample of Conglo Hess, approx  
 10' -

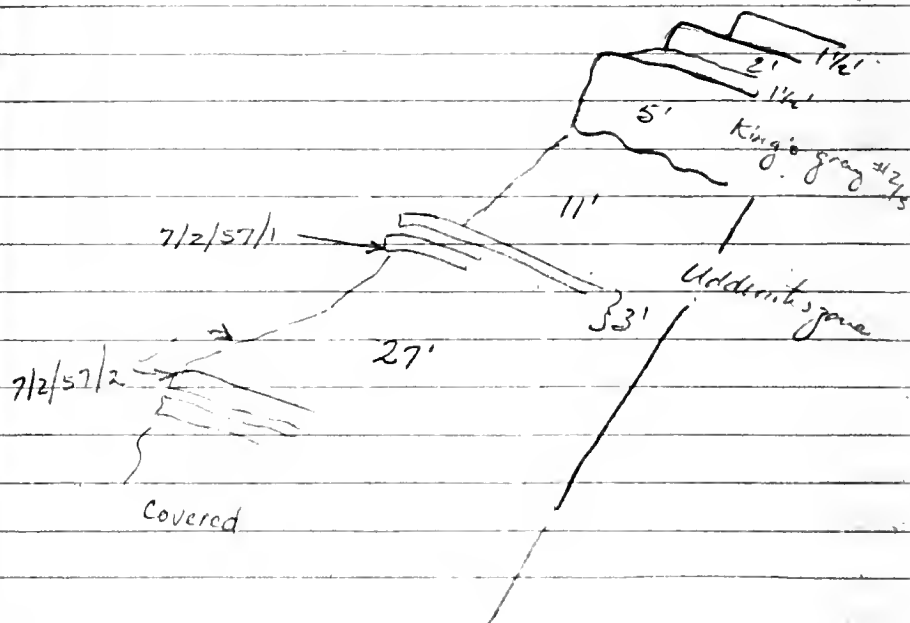
The Hess Conglo is about 35' to 40'  
 thick here -

7/2/57

Mr. James + ... into field with me

Looked over <sup>lower</sup> ... was fls. k of WCHs.

Mr. James spotted a ... in ...  
 little object of ... of ...  
 type ...  
 Uddenites Lindella





Section V West end of the WCHs - proper - Measured N20W  
From outliers

Below covered by But wash - Uddenites zone probably.

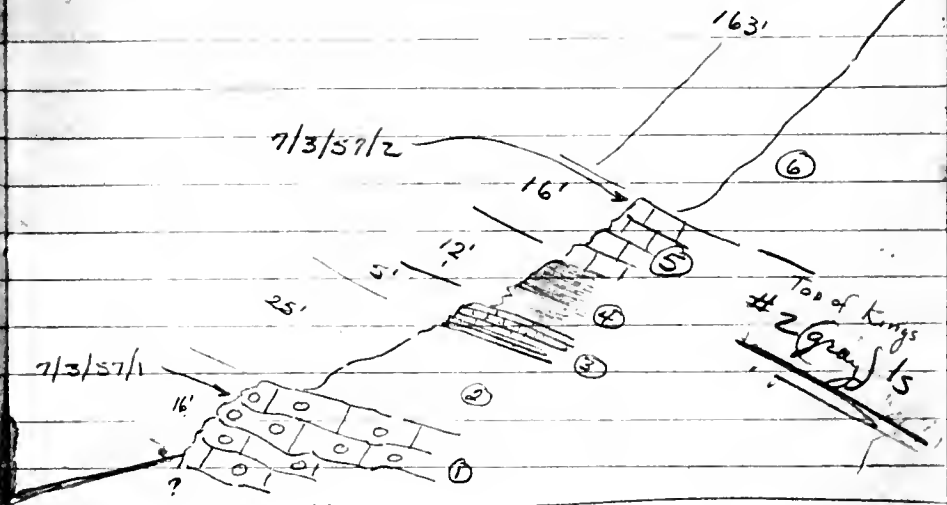
- 1.) Ls, Conglo, w/ Ooloid & brach frags., Conglo  
cobbles 1" to 4" diam. 16', gray outcrop -  
top surface is near flat, has an arch zone  
weathered brown. Many of the ooloid stems  
are ~~completely~~ <sup>partially</sup> broken and probably have  
had a great deal of erosional transport.

- 2.) Covered, 25' - seems to be an interval of gray shale  
a brown weathering calcarenite.

- 3.) Calcarenite - Brown weathering, lower surfaces  
appear to be a disintegrated ss. The upper surfaces  
are fine, laminated - 4" to 6" beds of ss.  
with interbedded silty clays. 5'

- 4.) Shale, blue gray in part covered 12'

- 5.) Ls, similar to #1 below, pebbles are 1/2" in  
diameter however; Near top is a good fossiliferous  
zone - This horizon divides vertically to the  
west. The upper part forming Kings bed "4" 16'



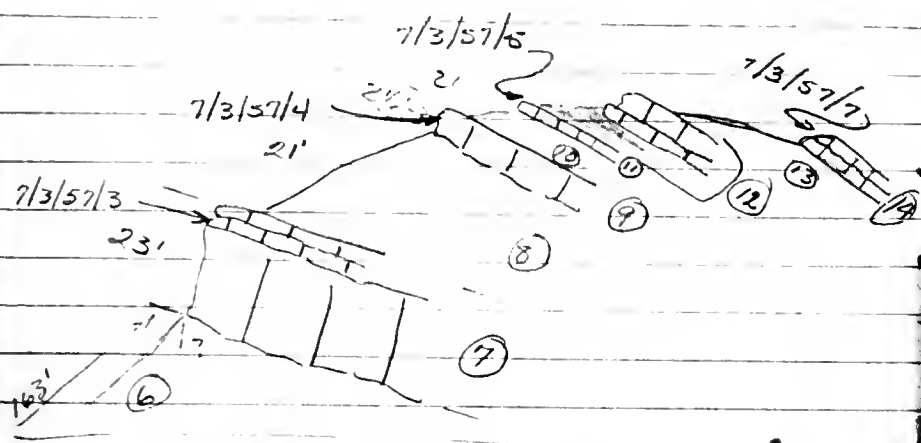
- 6.) Covered, 16.3' - How many beds are covered  
here is only guesswork - The value of this  
interval is of comparative proportions only.

- 7.) Ls, massive gray weathering, a shell hash  
which shows very little transportation.  
Corals, (long slender tetracorals), bryozoans,  
isolated fusulines, brachiopods, crinoid stems.  
Lower 18' massive - upper 5' in 6" to 1' beds.  
7/3/57/3 total 23'

- 8.) Covered, 21' - shale?

- 9.) Ls, blocky - yellow brown weathering, 6" to 1'  
beds, 2 1/2' to 3'? - Can't see any fossils here,  
top is planar, but lacks crinoid upper  
20.3'. Shell hash.





10.) Covered 2'

11) Ls., same as (9), 8" to 12"

12.) a, shale? 6" to 1'

b, shaly, conglomeratic (1/4" to 1" pebbles) organic frag. Ls. 2' (silicified fossils common)

c, Ls, coarse size organic frag. even top bedding surface 2'.

The beds above (12) form irregular steps on the dip slope to the NNW. Biohermal deposits cause the irregularity in the 6" to 2' ft. beds - 15' to 20' of strata on the dip slope of this ridge which is above bed (12), and not covered by alluvium.

Fault strikes N15W 25' strat displacement east apparently covered. This fault is 100 yds<sup>+</sup> east of section 5.

This afternoon I tried to trace bed 11, section III around to section I. Bed 11 is eroded away about in line with place where the lower part of section gets mixed up at the first turn in Geol. Canyon. The upper surface of bed 11 is nearly completely covered with fusulines - The next lower Ls. contains in Sect. II, bed 9, I don't believe has the great population of fusulines. Looking for bed 11, I drop down to what I believe is bed 9, at least the stratigraphic interval is about right - Then to bed 8? - back to 9? then a biohermal Ls., then a crinoidal Ls, finally to a Ls. with a reasonable number of fusulines - " about 300 yds from where I first lost 11. If this bed is "11" of section II then it is about 15' to 20' higher with 2 additional Ls. in between, perhaps several more. (ie, a chert separating 2 brown wuggy zones, capped by a Ls.)

13.) Covered 4'

14) Ls, brown-yellow-weathering, silicified fusulines + gastropods, some sclerid? spines.





(214)

This unit (14) is what I believe is equivalent  
in lithologic connection to bed 11, section IV.

20

(45)

7/3/57

Manning went to Alamosa to see about some  
photographs; SCS didn't have very good  
ones, so sent for U.S.G.S. photos -

Sampled from section V

7/3/57/8 - a rock sample from about 100 yds  
east of section V, from the third unit:  
at this point unit 3 is dipping  $26^{\circ}$  S45W.  
It is truncated by unit 5 which is dipping  
about  $10^{\circ}$  N45W.

7/3/57/9 - from Udaanluegane west side  
of Geologist Canyon, loose specimens - I believe  
the goniatites are fairly high, some good also -

7/3/57/10 - From top of #2 ls outlier - on  
dip slope -

7/3/57/11 - From top of a ls in Geol.  
Canyon. The question is if this is a  
Capitan ls then it would appear the  
#2 gray member of King is not present  
here as much more than rubble at  
the base of the #4 bed. This is the  
first ls going up stream after the  
creek makes the major swing to the East.



The rock on the rather flat top of the  
gray ls outlier seems to pretty well  
with the rest of the section the Canyon  
is a little higher than the  
position of the beds back at base is  
very good. I personally believe a  
discontinuity can explain the slippage  
on the whole (discontinuity) zone. Can it be  
the gray ls. rock seems. This seems  
to be the result of a syncline in the  
upper Gaptank beds which on this  
and the case in p. 26 apparently control the  
placement of the zone. The gray ls  
may well be the west, or the  
east may change. Technology and data  
which follow. E. B. - Holocene, paleo  
will be used to check this. If the  
#1 bed of Section I is Gaptank and the  
silty zone would fit in with the  
Udden zone. It is not clear  
from the top of the gray ls outlier  
that bed 4 is similar to as fairly  
correlate interval with bed 5 of  
section 5. I would put this at  
about 10' to 12' or just about the  
displacement of the little N-S fault.

If the fault up Geologist Canyon is for  
real, the collection from 11/2/57/11 should be  
Gaptank; I suspect however it will be  
found to be in the zone. If it is Gaptank  
then can be exactly explained as a bed  
truncated by the heavy beds of the #2 gray ls  
above and then by the #4 bed of gray near  
the creek bed. At this time it seems  
reasonable that the large central part of  
series are contemporaneous and are on near  
the top of Gaptank collection. The  
Udden-like zone near the outlier suggests  
it too could be a transitional or at least  
a high area.

The fossils I found today in the  
Udden zone indicate near shore deposition.  
The wood in all probably is too common to  
have been carried very far to sea, the  
pelagopods are small but a small  
Camaroto type judging by the elongate  
spherical ends of the internal casts.  
Some goniatites may suggest normal marine  
sailing but this point will require  
further checking.

The question of structural warping  
of the ls in the outlier of Kings Gray ls



submerged recesses or anclaves. I think that the lower two reef heads which filled the same recesses then by debris from the reef heads. The nearly level surface with 2 or 3 feet of sandstone extending nearly the whole length of the outlier would further suggest this. The collection of corals (7/5/57/10) I believe indicate slightly less turbid water (deeper?) giving these shallow water shell grass a chance to accumulate in well bedded strata.

Picture 445 on the way to the smaller gapland and the changed

Picture 446 on the lower part of the main reef bank in the hills

July 4, 1956 - Monday in Honolulu!

7/5/57

## Sect. 21

Section VI - about halfway between section IV & V.

1) LS, gray, massive in 2 to 5' beds, conglomeratic on the upper surface, but only slightly. Base of unit not observed.

2) Covered 6' - stream bed.

3) LS, yellow brown weathering, organic frag. (crinoid, fusulines), med size quartz sand on upper surface, well rounded, but not sorted, 2', upper surface is flat. 7/5/57/1

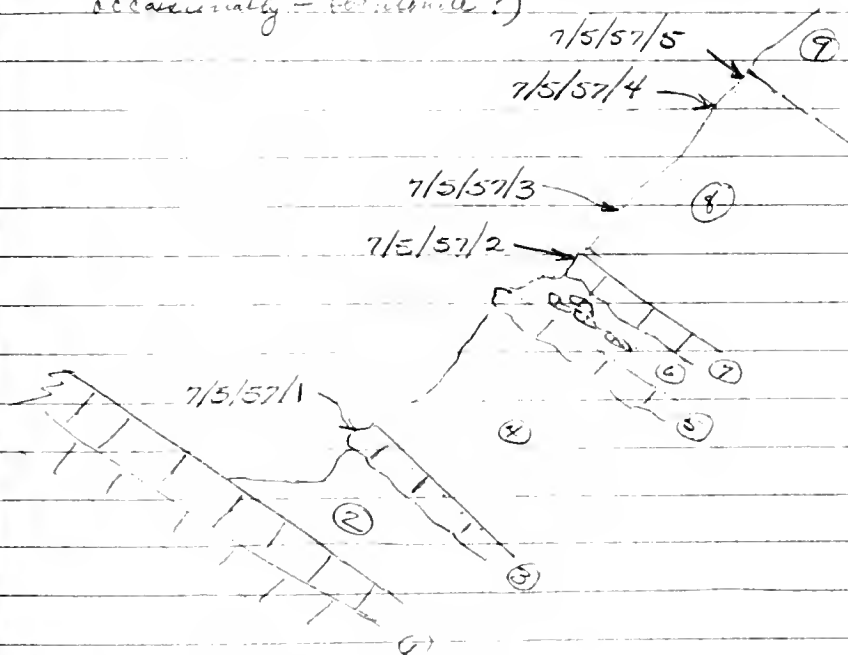
4) Covered 16' - probably a shale interval with at least one perhaps more nodular ls rubble beds.

5) LS, yellow brown weathering, gray fresh, organic frag. (fusulines, crinoid) replacement quartz in geodes, quartz sand upper surface. The quartz sand seems to have been washed across the ls and some quartz attached to the ls surface - fusulines are bedded in this ss layer. 1'



- 6) Core " 3', probably gray shale & ls rubble
- 7) Ls, brown green, fresh surface, orange-brown weathering, shell mostly brachiopods, fusulinas, bryozoans. progressively finer grained down ls. Upper surface is flat 1" 7/5/57/2

- 8) Shale, blk to blue, slightly silty, household petid odor. 35', brown and variegated silt grains 1" occasionally - (brachiopods?)



- 9) Covered. 53'

- 10) Ls, yellow-brown weathering, (gray fresh) organic frag. (crinoids) - I'm not sure this unit is not changed down from above. 3'

- 11) Covered, probably shale in great part. a lot of ls rubble in upper part - 37'

- 12) Calcareous, Brown-yellow weathering; some sand (quartz) and upper surface loaded w/ fusulinas, but seems restricted to upper 1" 2 1/2'

- 13) Ls, rubble for most part, pretty badly covered and it is possible that there are several shale intervals. 26'

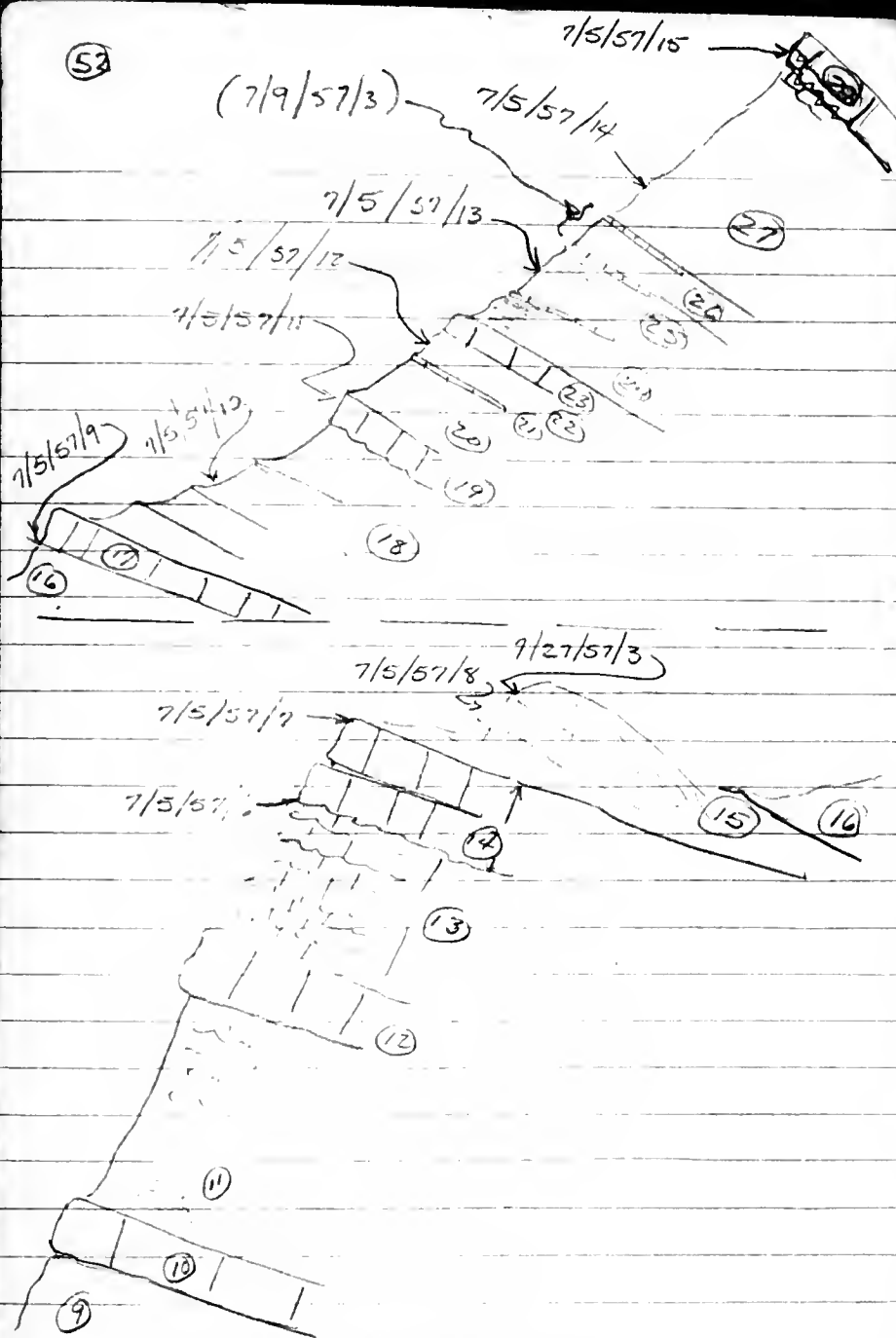
- 14) Ls,

- a) Calcareous, brown-yellow weathering; med sand size through out 2 1/2 to 3 1/2' flat top
- b) shale parting 2" to 3", gray shale
- c) Ls, congl at base grading up to coarse sand size, organic frag. crinoids brachiopods, etc, bryozoans, 5 1/2'





(52)



(53)

15.) Biohermal rubble - lower few inches maybe shaly and then rubble ls., great part is ls., gray, (weathering - yellow buff), corals, brachiopods, sponges(?), fusulines  
10'

16.) Covered 14' on dip slope of 15 + 14

17.) ls., fine pebble congl., organic frag. of which fusulines seem to dominate, Bryozoa  
3', fine grained near top, flat upper surface,

- 18.) a) covered 4', probably gray shale  
b) 4" brown weathering calcarenite + sand (quartz)  
c) Gray shale 6'  
d) 2" orange-brown silty calcarenite  
e) 6' gray shale  
f) 3" l.s. like b.  
g) covered 7' gray shale probably.

19.) ls., orange-brown weathering congl (ls.) in part, pebble to coarse sand in top 6", more yellow and rubble near bottom 3'  
Organic fragments: Quartz sand on upper flat surface, scattered fusulines also.



20.) Covered 10' (shale probably)

21.) 4" <sup>to 8"</sup> brown (orangeish) calcarenite w/ quartz

22.) 5' Covered (shale probably)

23.) LS, calcarenite, <sup>middle</sup> finer, progressively to top.  
The upper 3" are well laminated, flat top,  
"

24.) a) Shale, variegated brown 3'

b) 1" thin bedded calcarenite with siliceous  
matrix. Laminated, very fine quartz sand also

25.) a) Shale, gray 5'

b) 4" calcarenite - some quartz very fine  
to fine grained

26.) a) Shale, gray 4 1/2'

b) 6"; later (25 b)

27.) Covered - 30' probably shale and at least  
2 calcarenite beds

28.) Calcarenite, rubbly in lower 1 1/2' feet,  
organic frag.; become progressively better  
laminated in upper 6", flat top surface,  
2', some quartz & fine sand & silt on top surface

29.) Covered 41', several calcarenites with gray shale  
probably

30.) Calcarenite, organic frag. (brachs, furculines,  
crinoids) 10" flat surface is not  
striking on this bed; wood fragments

Collection 7/5/57/16

31.) Covered 18' - probably gray shale -

32.) Marl, silt & clay in matrix and as  
coarse sand fractions. Has a well  
laminated upper 2" with flat top.  
Sort of a transition between influence  
of <sup>marine</sup> environment of deposition? 2'

Collection 7/5/57/17

33.) Covered 31'

34.) "Hess" Congl. 30' +



[see p. 67]

7/6/57

[VII]

Section 7 - low hill to west of Wolfcamp well.  
The long section runs due north.

Covered section

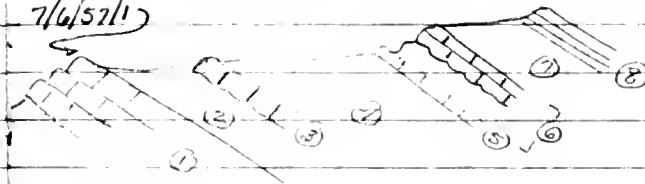
- 1.) Calcareous, pebbles  $1\frac{1}{2}$ " to 2" med, calcareous sandstone + calcareous mudstone. Fossils (Crinoids, etc.), bedding  $1'$  to  $1\frac{1}{2}'$  feet. Flat top  $4\frac{1}{2}'$  gray fresh, light yellow brown weathering.
- 2.) Covered  $2\frac{1}{2}'$  probably shale or weakly cemented rubble.
- 3.) Calcareous, with a few small pebbles, juveniles common. Crinoids common. Quaky sands in upper part, 18", flat top. grayish brown weathering.
- 4.) Covered  $11'$ , prominent shale & 1 or 2 calcareous beds (less than  $4$  to  $6"$  thick).
- 5.) Covered, brown weathering, some quartz sand  $2"$  to  $1\frac{1}{2}"$ .

7/6/57/3

1000 ft

7/6/57/2

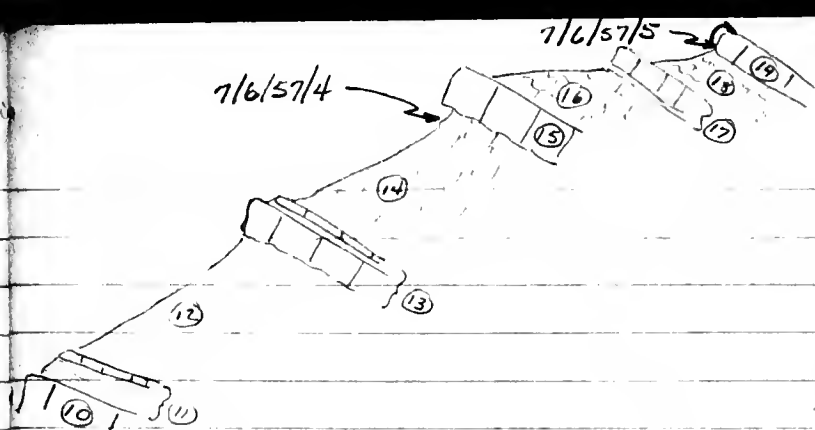
7/6/57/1



- 6.) Calcareous, gray brown weathering, shell beds, juveniles, crinoids, + brachiopods. Lower part of unit is a shale which grades into a ls rubble, then into a well sorted frag. ls. Upper surface is planed flat. Total  $5'$ .
- 7.) Covered  $8'$  - gray shale + some salty calcareous.
- 8.) Calcareous, well graded med sand, a few juveniles (small) and where joints of crinoids - some of beds in a 4' interval.
- 9.) Covered  $40'$ . The lower 20 feet is probably mostly blue-gray shale. The upper  $15'$  probably mostly ls rubble.



- 10) Co. white, 2" diam pebbles, some *Ceroides* & bryozoans, a few forams, brown weathering, gray on fresh surface. 4'
- 11.) a) shale break - 1'  
 b) 4 to 6" unconsolidated Calcareous, unindurated upper 2" gray upper surface. total 1 1/2'
- 12) Covered 24' - probably shale (gray) - 1 or more brown calcarenites maybe present.
- 13) Calcareous, brown weathering, lower part a shell wash, a shale bed and then the rest is 4" to 6" calcarenite unindurated. total for unit, 4 1/2'
- 14) Calcareous, (ls. rubble) [The main difference between the so called "rubble" and what I've been calling ls. congl. or calcarenite seems to be the cementing material. In the "rubble" the cement is clay & it weathers to a yellow or yellow-brown. Gray & mottled brown weathering. 18' in. 6" to 18" beds.]



- 15) Calcareous, brown weathering, fragments in lower part fine pebbles to coarse sand sizes, progressively finer toward top - medium size at top, no apparent lamination. 3 1/2'
- 16) same as (14), 5 1/2'
- 17.) 3" shale break  
 1 1/2' of calcarenite like (5)
- 18.) like (14), 4'
- 19.) like (10), 1 1/2' but pebbles 1" to 1 1/2" diam





(60)

20.) Mostly covered, 7', at least 3-4"  
brown weathering Calcareous, the rest is  
probably gray shale.

21.) Like (19). The upper 1/2' is well laminated,  
has some bl. chert in seams 11 to bedding.  
1 1/2'

22.) Calcareous & gray shale - 3 6" to 1' calcareous  
brown weathering. General & fine fragmentary  
4 gray shale 1' to 1 1/2'  
total 11'

23.) LS., gray weathering, broken layers. 17'  
upper part is gradually bedded in 2' units  
lower part is rubble.

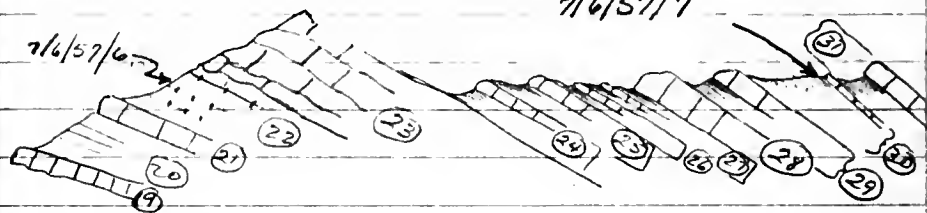
24.) a.) 2 1/2' gray shale  
b.) 1/2' calcareous, brown weathering (like (15))

25.) like (24) a.) 1 1/2'  
b.) 1'

26.) like (24) a.) 6"  
b.) 6" to 2" thin to east

(61)

7/6/57/7



(27) as (24) a.) 1 1/2'  
b.) 8" to 4"

28.) Calcareous - lower 1' rubble as (14), but  
2' as (5).

29.) as (24) a.) 1 1/2'  
b.) 2 1/2'

30.) as (24) a.) 4'  
b.) 6"

31.) as (24) a.) 2'  
b.) 2 1/2'



32.) Shale gray,  $5\frac{1}{2}'$ , 2 calcarenite bands,  
2" to 4" thick, fine grained

33.) as (15)  $2\frac{1}{2}'$

34.) a) shale, gray 1" to 8"

b) gray ls, shell pieces calcarenite 6" to 1'

35.)  $6\frac{1}{2}'$  - like (14) lower 5', like (5) upper  $1\frac{1}{2}'$

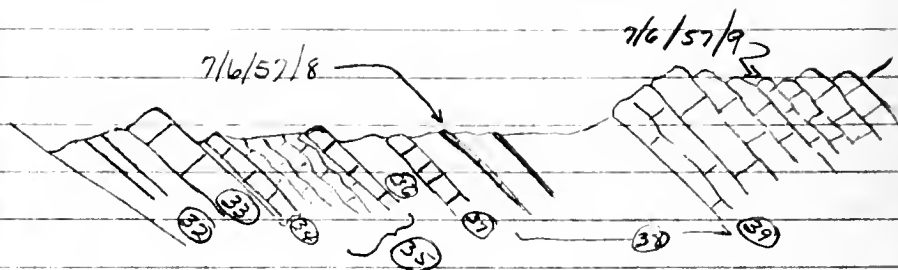
36.) shale gray, mostly covered [4']

37.) Calcareous orange brown upper surface,  
flat 1'

38.) Mostly covered, 2 4" calcarenite beds at 4'  
and 10' are exposed  
32'

39.) Calcareous "rubble" block of gray ls 6" diam  
brown mottled zones with crinoid + fusulinid  
in them. beds 1 to 3', occasional  
evidence of the beds being well sorted  
and cemented at top 2 observations

of this feature. 27'



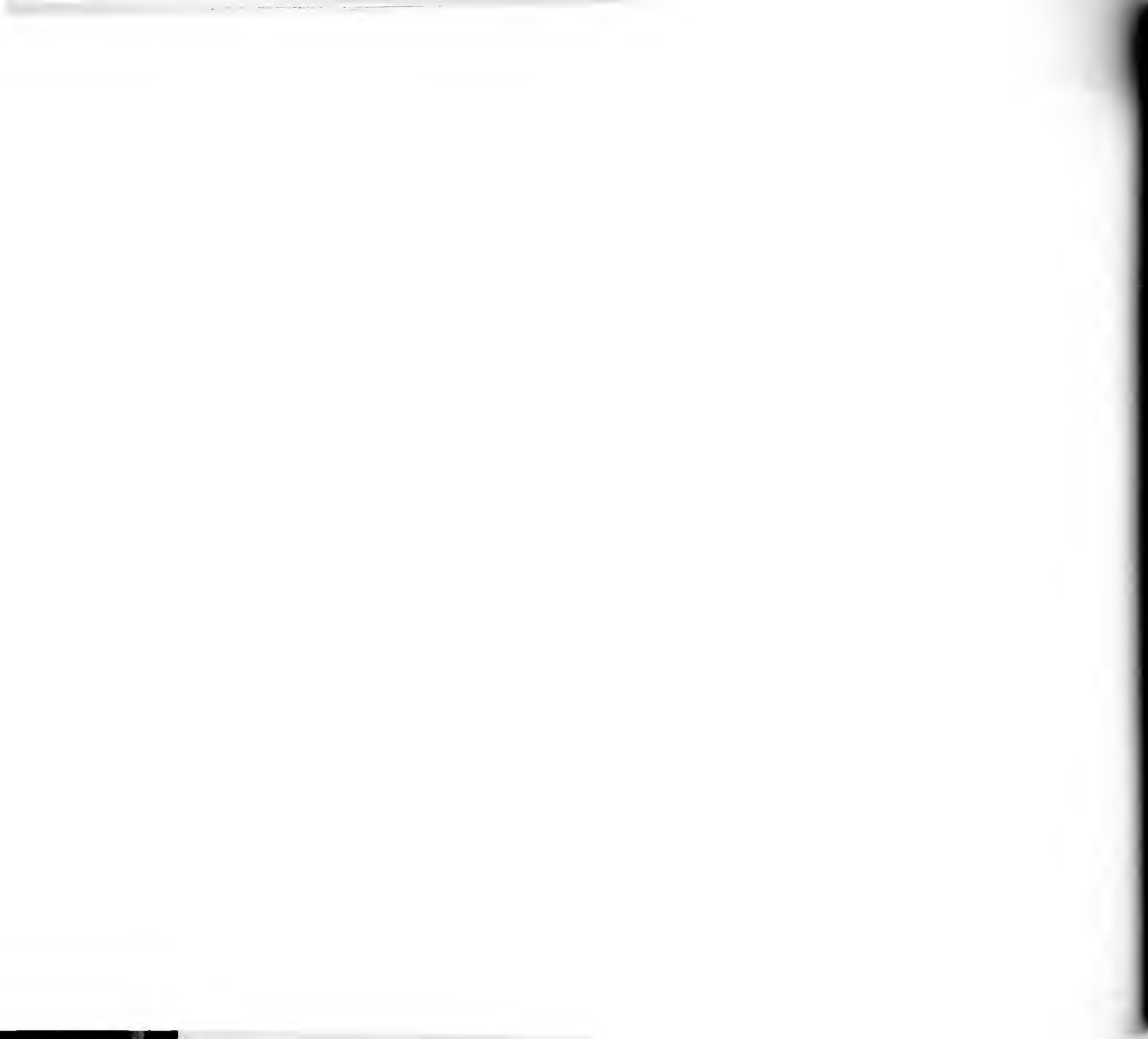
40.) Covered 11' probably less resistant ls. with

41.) like (39) 26' The calcarenite making the  
top bed in this sequence is well sorted and  
bedded, well cemented, flat top.

42.) Covered 20'

43.) Calcareous, well cemented, yellow-brown,  
 $1\frac{1}{2}"$  diam pebbles, becoming fine grained  
in upper 3" flat upper surface.  
 $3\frac{1}{2}'$

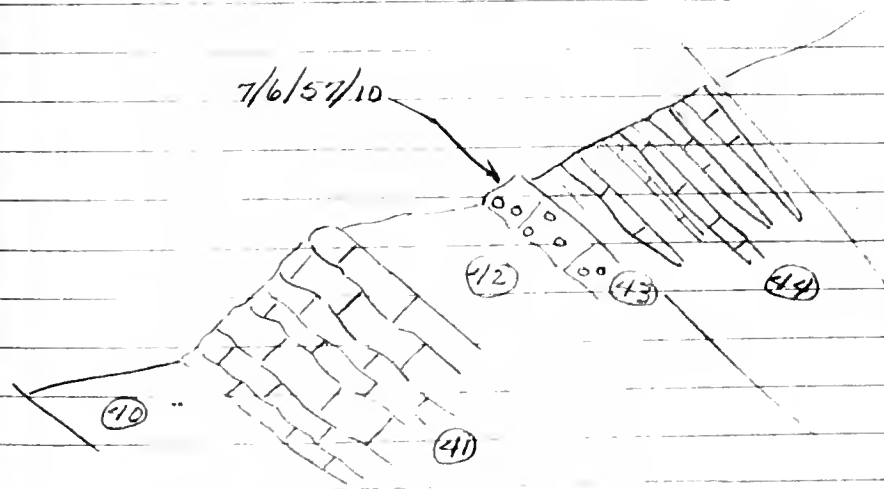
44.) 16' lenticular calcarenites, these are  
interbedded with shale, 50 yds to west  
I could find only 3 or 4 relatively  
thin beds.



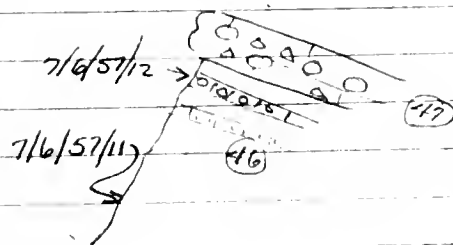
45.) Covered. 64'

46.) Gray shales - or interbedded orange + brown sandy siltstones. 53' covered to a large extent -

47.) "New Congl." 8', Calcareous with a fair number of dark chert + quartzite pebbles 1" to 5" diam.



Collection 7/6/57/12 from a yellow weathering congl. about 6' below bed 47 - It seems to differ from bed 47 in yellow color and that about all. 2-3'



(45)

The zone of biohermal 15, #23, seems to carry through pretty well.

I believe that #23, section III, is equivalent to #15, section VI, and to #7, section I.

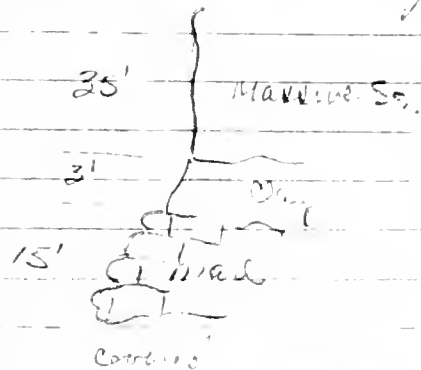


7/7/57 Big Bend Park.

The first collection is near same place as is the John Wilson Coconino Devonian exhibit just to the south of Jack HQs

7/7/57/1. Shale. Co. a few 10's of feet above the upper boundary.

7/7/57/2. along Williams Cr., Terlingua Quad. 1. 13' to 32' Shale, grayish, yellowish.



7/9/57  
4/5/57

[see p. 56]

Wolfcamp Lills - Continuation of Section VII

48.) Shale, very silty, grades into a 6" sandy siltstone. light yellow-brown weathering  
3'

49.) Congl., fine sandy matrix, poorly cemented, 1/2" diameter pebbles - a few 2 to 4" bands of greenish gray siltstones. 6'  
Collection 7/9/57/2

50.) Congl., 3" to 4" cobbles at base of a subunit. The subunit grades to a ledge forming (indurated) fine sandstone. 3 or 4 such subunits observed. Top of each subunit is rather planar, coarsest congl. rest right on top of this planar surface.  
14'

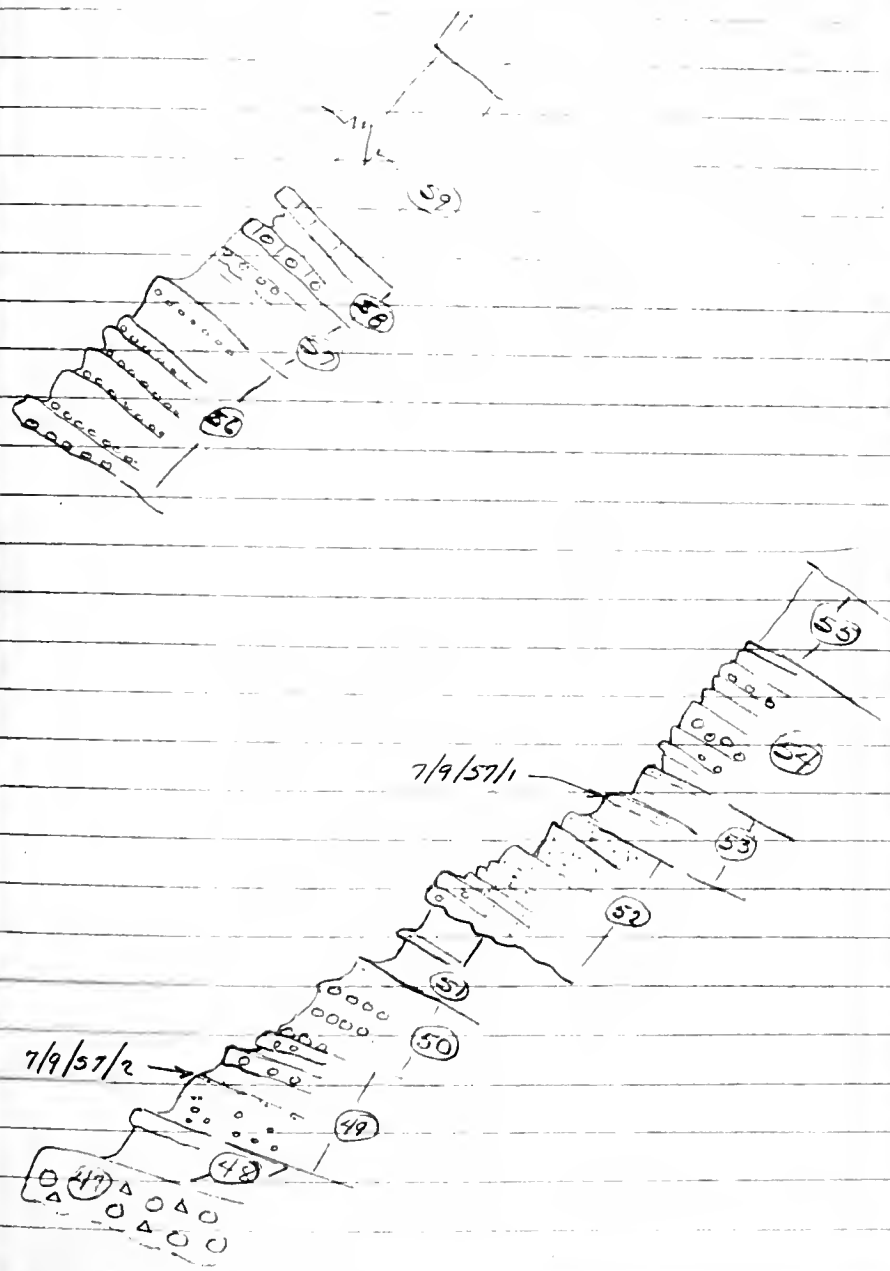
51.) Shale and siltstone, gray to yellow brown,  
5'

52.) Sandstone, yellow gray weathering, in 4" to 10" beds with 2" silt partings.  
16'





(68)



(69)

53) like #50,  $\frac{1}{2}$ " to 1" pebbles, 5'

This grades laterally into 6' of gray & yellow shale & siltstone

Collection 7/9/57/1

54) Sandstone & Congl. 3" to 3' lenticular beds. Congl. 3" diam max. Sand is mostly calcarenite, 10'

55) Covered 6' - mostly gray to greenish gray siltstone

56) A multicycler(?) unit like #50, 3" cobbles 1' to 1 $\frac{1}{2}$ ' per subunit. 9', calcarenite sandstone are very fine to fine size

57) Sandstone - very silty, & very fine sand size greenish-yellow brown weathering, 3' and a ledge  $\frac{1}{2}$ " to 1" pebbles 4 $\frac{1}{2}$ '

58) Calcarenite & Calcarenite - 4" to 6" silt parting 2 $\frac{1}{2}$ ' gray to slightly yellow gray weathering.

59) 57' covered



(70)

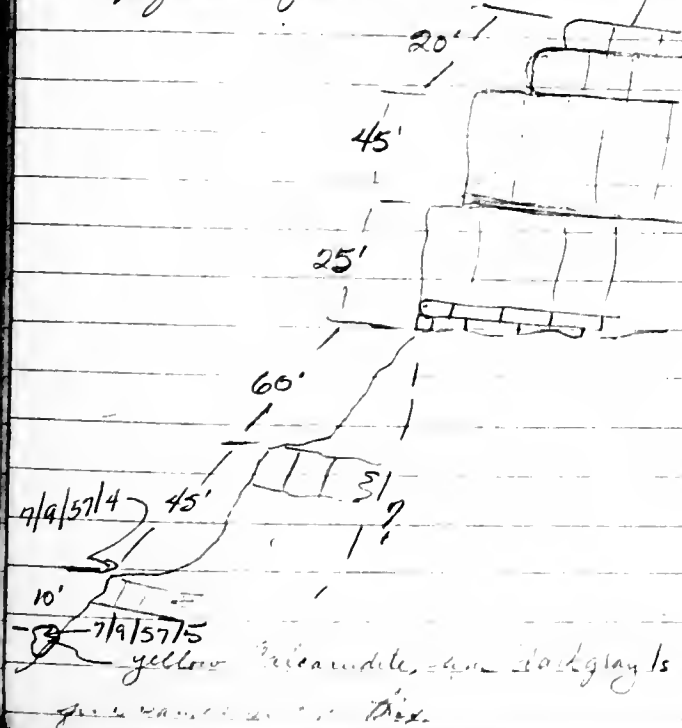
60.) Metamorphosed ls, and some baked shale  
5'

61.) Rhyolite sill

Top of Section 2nd 13' 2nd 24'

Collection 7/9/57/3 - from ant Hill in smaller  
WC. small, in about horizon of #25 or #26 of section  
VII.

Collection 7/9/57/4 - dark gray ls in slope of  
#2 (gray ls) of King Outlier - SE flank 1/3 of way  
up from gate - I doubt if it is in place



26

## Section 26

(71)

Section 8a 2 1/2 miles NE of Neal Ranch House  
Lower part of section badly covered.

1) Sandstone, 1 fine gr, yellow weathering -  
Tetrad corals, brachiopods, sponges?, fusulines?  
This is a fairly porous and most fossils are empty mold.  
1' to 2'

2) Covered 12'

3) Ls, gray, shell rich, brachs, crinoids, fusulines  
9', Collection 7/9/57/6,  
4" to 1" bedding. At top of unit a bed like #1  
is capping.

4) Covered 29'

5) Ls, gray at bottom (2') 7/9/57/7  
42' above  
are gray brown weathering dolostone  
no fossils identifiable. 2" to 4' beds

6) Covered 14'

7) Dolostone, yellow brown weathering. 1' to 3' beds  
12'



Section 8a runs up a small slope. The various angles between and covered intervals between these outcrops are suggestive of some structural disturbance.

Section 8b begins on what I believe is bed 7 of 8a

8.) 69' covered.

9.) Sandstone, poorly undulated, v. fine sand size, some silt, well sorted however.  $\text{CaCO}_3$  as common as sand grains - greenish gray or yellow. 36' 1"-3" beds.

10.) Ls., nodular uneven bedding, 3' to 6" beds  
Collection 7/9/57/10 3' above base  
38' (See page 21) Collection 7/9/57/11  
15' above base.

11.) Siltstone, pebbly, yellow weathering, some sand is more pebbly than silt! 15' poorly cemented

12.) Siltstone with pebbles - siliceous cement 2'

## Section 2b

13.) Shale and siltstone (10') green gray color, 2 6" welded siltstones (siliceous) near top.

14.) Sandstone, very fine to fine grained, siliceous cement 2'

15.) Shale 9' green-gray "bumpy", mostly covered

16.) Siltstone w/ siliceous cement, 6" to 2' beds - 2" to 6" shale or silt partings. buff colored. 11'

17.) Shale (some siltstone), in beds 6" to 1', siliceous siltstones, in 4" layers 10'  
Collection 7/9/57/12

18.) Covered 26'

19.) Siltstone, siliceous buff - [2']

20.) Ls, yellow weathering 3' - brown blocks where there were once fossils - very silty

21.) Covered 16'



(74)

22.) Sandstone, pinkish brown, well & thin  
laminated - Calcareous

6"

23.) Covered 30'

24.) Silty, Brown-orange weathering,  
dolostone. 4' was fossiliferous

[25']

25.) Covered, above that Coarse Calcareous  
10" or more -

27

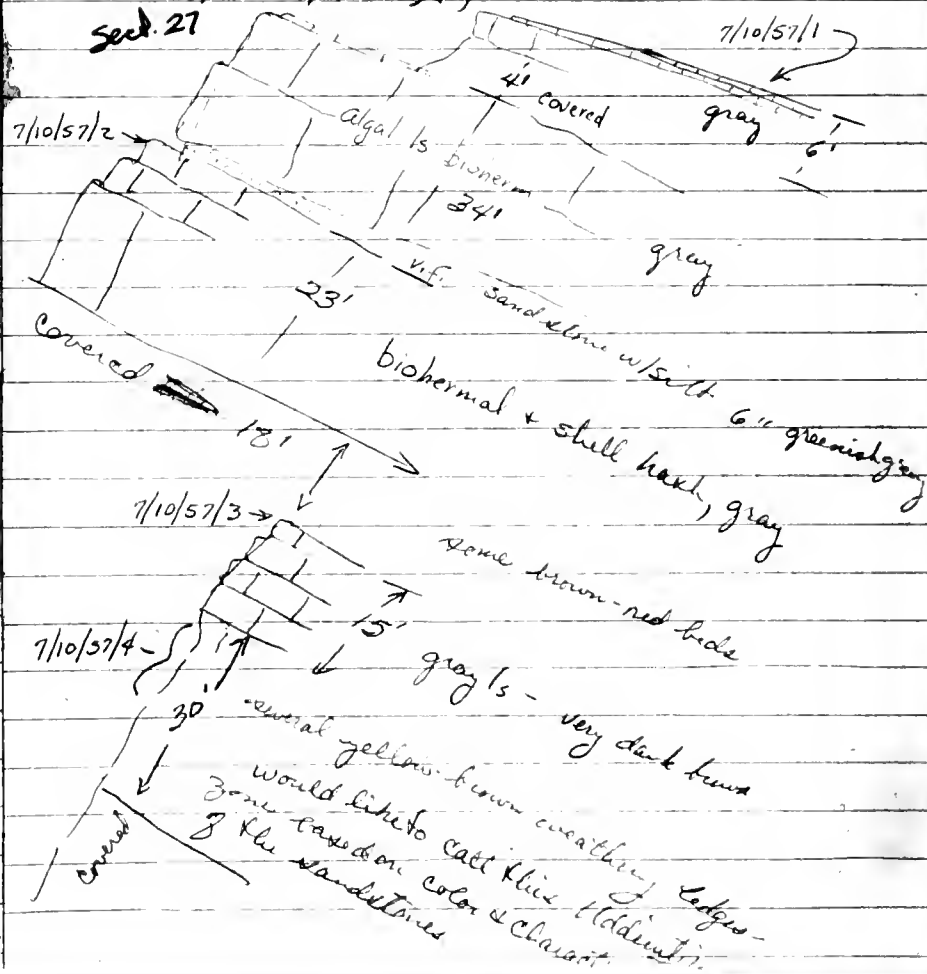
Sect 27

(75)

7/10/57 C. Brooks Ranch SW exposure. Also  
over the fence on to part of the Neal Ranch.

The ls cliffs on the NE. part of the Neal Ranch are  
lithologically continuous with the interval #3 through  
#7 of Section 8a. The "unit thickness" varies  
but seems to be fairly continuous throughout.  
Section 9 (dip 7°-10°) (N)

Sect. 27







## Sect. 29

[see p. 150 of Nb 2]

## Section 10 (dip 10°) (N)

Covered below - float looks like bed #2 section I

- 1.) LS, organic fragmental, crinoids brachiopods  
weather light gray with tinge of yellow

2 rubble zones near base -

a) 14' massive

b) 3' in 1' beds (gray)

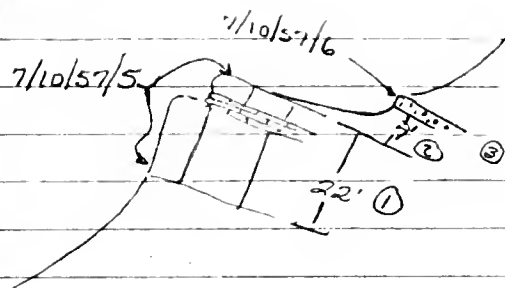
c) 5' gray &amp; yellow massive

Top Gaptank

- 2.) Covered '1' some gray shale, probably all coal!

- 3.) Sandstone, very calcareous (grams)  $Fe_2O_3 \cdot H_2O$   
acting as cement? weathers deep yellow brown.  
3' There are surfaces coated with  
crinoid frags.

- 4.) Shale gray with few gray siltstone & v.f. sandstone  
grading upward into dominant silt sand  
over the shale - unit is essentially gray  
weathering through out, becoming slightly  
yellow near top. 139'



- 5.) Sandstone fine grain, yellow orange weathering  
3" to 8" beds, even bedding, nearly  
uniform size & color throughout unit.  
total 53' Upper 3' are in 1' beds, paler  
colors than below.

- 6.) 15' covered



7.) Ls, gray, rather fine shell hash.  
mostly brachiopod fragments recognizable  
8'

8.) 14' Covered

9.) Ls, gray massive, shell hash, 2 beds 6'  
separated by 6" of ls rubble.  
12 1/2'

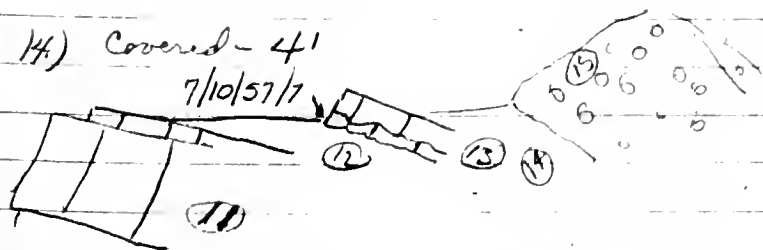
10.) Covered in part - most is a less resistant  
nodular limestone gray brown weathering  
brachiopod hash.  
23'

11.) Ls, gray massive broken up 28' (broken!)

12.) Covered 5'

13.) Ls, gray, rubble at base 2 1/2'  
fine hash -

14.) Covered - 4'



15.) Calcareous, cobbles 4" to 6" diam (largest);  
light brownish weathering ls matrix. This looks  
like the "Hess Congl" in the Wolfcamp Hills  
15' plus (eroded upper part)

Colored Picture 24 or 25 - of a "typical" (?) cyclic  
sequence of Wolfcamp.

1.) gray-yellow shale } 2' to 3 1/2'  
2.) ls with and fully fusulines }  
3.) ls rubble 1'  
4.) Calcareous 8" } orange-brown weathering  
5.) " 2' }

Collecting  
7/10/57/4

This is probably not typical of the  
Wolfcamp hills, but seems typical  
of eastern exposures on Brooks Ranch.



(80)

30

Sect. 30

Near south tank (mile?) Brooks Ranch

Section 11 - began at top of Gaptank ls.  
(dip 7° N)

1.) Ls, (Gaptank) <sup>dark</sup> gray weathering, 8' massive, upper part contains 1/4" to 1/2" gravel calcarenite only in upper part.

2.) Covered 11'

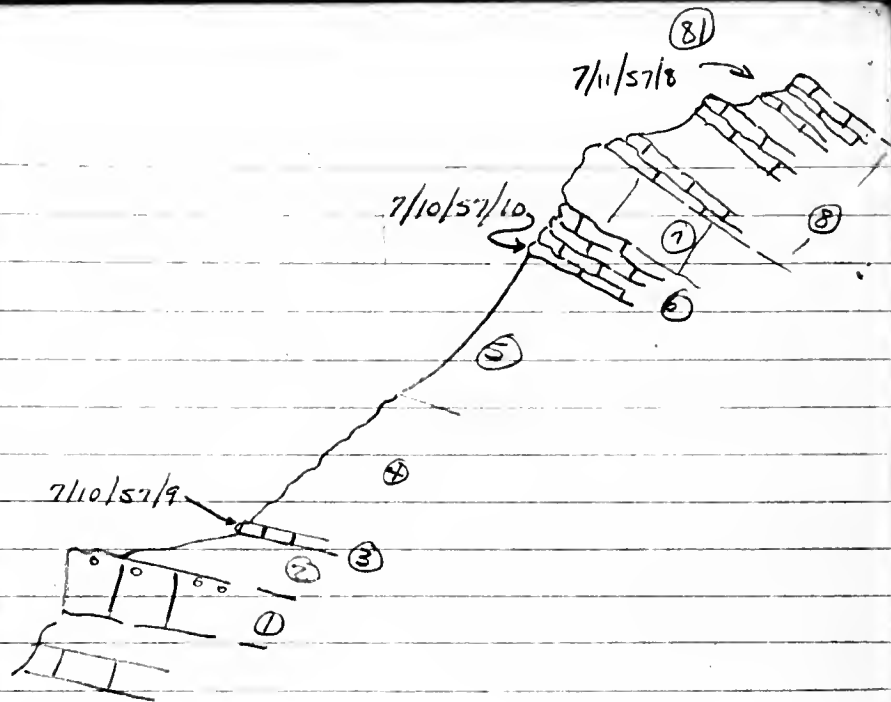
3.) Ls, still ~~shaly~~ but not readily identifiable  
1' Collection 7/10/57/9 <sup>o</sup> fetid, black on fresh surface, weathers dark gray with spots of iron stain.

4.) Sandstone, very limy, light yellow to orange weathering, 6" to 1' beds, 34'

5.) Covered, probably gray shale 27'

6.) Calcareous, gray weathering, fine sand size, and quite a bit of siliceous shell size.  
1" to 6" beds, irregular bedding  
15' 7/10/57/10

7.) Ls, <sup>blue</sup> gray weathering, massive bihermal, brach. frags but very fine grained. 4'



8.) Ls, light gray to light brown to tan weathering. beds 2" to 6", uneven or rumpled. fine grained for most part. <sup>(no large frags)</sup> several intervals are covered, but seems to be less resistant ls. rubble. 23'

9.) Covered 17'

10.) Ls, blue gray, sort of a rubble, but almost a calcarenite. darker "pebbles" are in a lighter matrix, but the difference seems to be one is reticulate around the other, not good pebbles. 22' 1" to 8" beds 7/10/57/11



7/10/57/13 (19)

(18)

(17)

7/10/57/12

7/10/57/10



(11) Ls, light gray weathering, massive, fine grained, 11'

(12) Ls, shell hash, weathers mottled gray brown, crinoids, bryozoans, a few brachiopods, 1/4" to 6" beds, a few inches of shale at the base of this unit. Top of unit has brown weathering color characteristic of the middle upper Colfax cycles. 15'

(13) Shales in lower part (5' to 7'), becoming more silty and sandy, fossiliferous sandstone in upper 2' to 3', 1' shell hash. Collection 7/10/57/8 see note on picture p. 79. 18'

Between unit 12+13 slicken side surfaces were seen cutting the down dip exposure of bed 12, no major displacement has taken place, but this seems rather to be the adjustment to a slight Post Hess warping forming a gentle syncline near the tank.

(14) Calcareonites, yellow to orange brown weathering quite quartz rich and might be best considered as a quartz sandstone, 2 1/2'

(15) Cycle -

a) 4' gray shale

b) 1' like #14 below (at top)

(16) Gray shale 9'

(17) Sandstone yellow weathering, 1' beds or less, 16'; The fine sandstones have a great deal up to 40-50% fossiliferous, crinoids, gastropods, - 7/10/57/12

(18) Covered, probably continuation of (17) [15' ?]

(19) Ls, weathers gray to brownish gray, shell hash, brachiopods, some fusulines. [12' ?] 7/10/57/13





20.) like #19 7'

21.) Sandstone, v.f. high  $\text{CaCO}_3$  4' greenish-yellow

22.) like #19, 21'; changes to dolomite along outcrop (100')

Although no Conglomerate beds were found, I believe beds 19-22 are in the same interval as the "Hess" Congl. of section 10.

(Conglomerate only in Hess section 10)  
The Hess Conglomerate bed in the lower Hess in Section 10 and in Section 11 becomes a ledge in the Congl. in the Wolfcamp hills and in section 10 are local lenses and not a good mapping horizon. The light gray ls. at the approx. level these conglomerates appear to be a fairly consistent outcropping horizon. Without the benefit of junction evidence shown at this time suggest the beginning of valley and flow to very fine sandstone at the highest "cyclic" Wolfcamp. The Wolfcamp hills seem to be a persistent unit also, although it is often obscured by talus.

The upper beds of the Wolfcamp are apparently missing in the western portion of the Brooks Ranch as a result of erosion. The ls. cliff forming Wolfcamp north is probably equivalent to the #12 gray ls. member which in the hills proper. Upper Wolfcamp cyclic deposits were observed down dip from the eastern most cliff on the Brooks Ranch (to be measured later) and also at section 11. The gapland limestone occurs. The prominent cliff former in the low hills east of section 11 because of thinning of the #12 gray ls. of King and also because of some thickening of that (gapland) unit to the east.

The upper Wolfcamp beds in Sect 11 are in a structural low and show evidence of being deformed slightly prior to Hess ls. deposition.



(86)

28

Sect. 28

7/11/57/

Section 12; at head of draw N of section 10  
covered below

1) Ls, gray, massive beds, 3 to 20' bedding  
bichermal, rather in fragments - 51'

2) Covered 7'

3) Ls, gray, uneven bedding near base,  
more massive higher. gray weathering  
Crinoid stems + pinnules near base  
3' 7/11/57/1

4) 1' Cover. 6

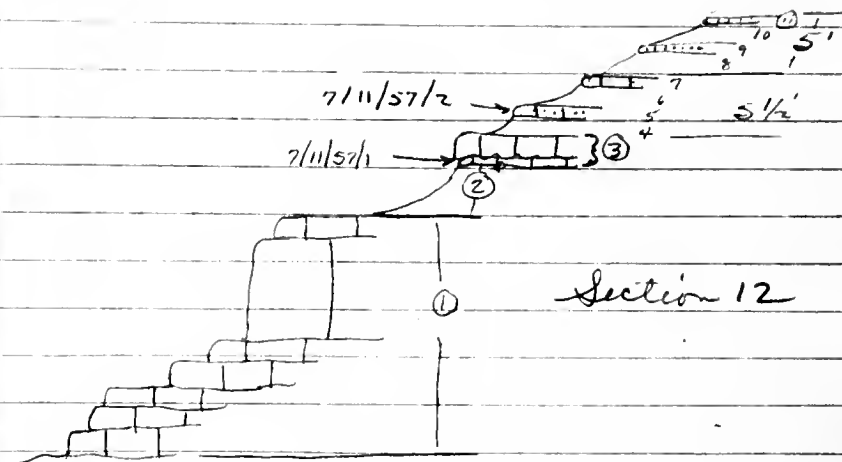
5) Calcareous, yellow brown weathering, brown  
gray on fresh surfaces. some fusulines  
and brach shell fragments - 7/11/57/2 1 1/2'

6) Covered 2'

7) Calcareous, yellow brown weathering  
some mottled gray, corals, crinoid, & brachiopod  
fragments. [1']

8) Covered, gray brown shale 1' 1/2'

(87)



9) Sandstone, fine grained, yellow to gray  
brown weathering, 6" (calcareous quartz)

10) Shale gray, mostly covered 2'

11) Sandstone, fine grained, orange brown  
weathering, calcareous quartz  
8" to 1'



(88)

12) Shale, brown to gray with 1" to 3" lenticles of siltstone & sandstone (fine) poorly indurated. 22'

13) Covered 23'

14) Sandstone, brown to yellow weathering in 3" to 6" beds, gray on fresh surface. Calcite cement & some calcite grains 40 to 60%. Crossbedding 1/2" to 1" fine & not sand well sorted; I believe this to be calcite <sup>back</sup> on beach, maybe a little & both. 27' 7/11/57/3

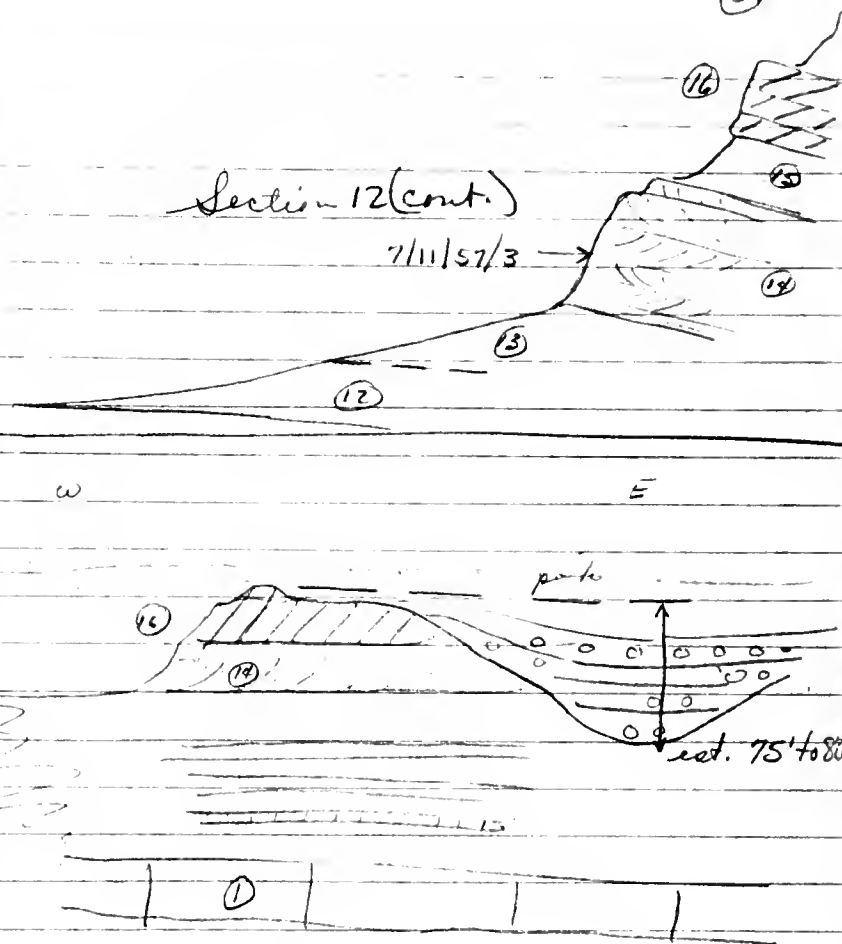
15) Covered 18', is rubble?

16) Dolomite, 45'+ brown weathering.

Above are undoubted Hess beds of general position & lithology as 19 through 21 of section 56.

(89)

Section 12 (cont.)



Really need to work this out on photos!



(90)

31

## Sect 31

Section 13a - 1/4 E of Section 11 - up front  
of low ridge - To top of hill 4752  
Sect. 27 of King

11.) LS, dark gray, (crap) looks like  
beds of rubble - 3 to 4" diam blocks  
5 1/2' thickness 7/11/57/4

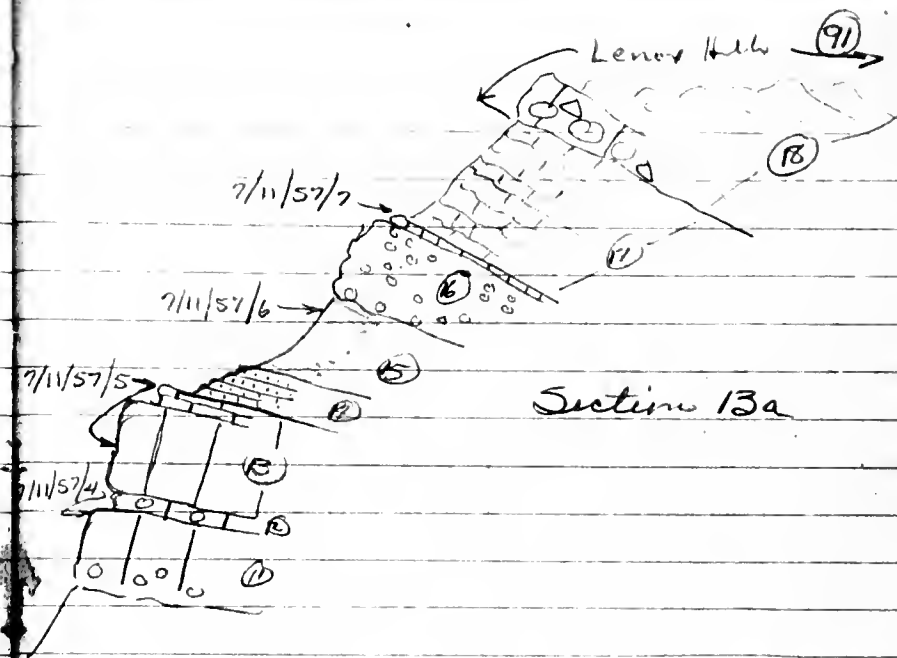
12.) LS, rubble, dark gray, in 3" beds very  
massive, 1 1/2'

13.) LS, like 1, upper 2' in 8" to 1' beds, lower  
9' massive, weathers to irregularly  
pocked, but rather smooth massive.  
7/11/57/5

14.) Sandstone, fine grained weathers orange to  
yellow, some green column patches.  
3' to 6' beds; 3 1/2'

15.) Covered, but seems to be a dark  
red brown shale zone. This is  
same color as is at top of  
ridge on p. 3/4 mile W. 7/11/57/6  
7'

16.) Calcareous - all sizes, up to about 2" diam  
Small pieces of *Torus*? chert and other cherts  
subangular to subround. Upper 1' organic frag  
7'



17.) Mainly covered, LS, rubble, purples, gray  
yellow-browns - 5" to 8" beds  
28' 7/11/57/7

18.) Calcareous, cobbles 6" to 10" diam; mostly  
ls cobbles, but a few large chert cobbles +  
quartzite also. Also 3' to 6' beds -  
cementing ls weathers yellowish  
45' to top of ridge





Collection 7/11/57/8 from the zone of #8 & 9 units in section 11. The ls have changed to Calcarendites and much thinner. They seem to thin rather than being entirely truncated at Section 12. This collection is from a saddle on the NW. side of the Ridge. Section 13 is over.

Collection 7/11/57/9 From Gaptank ls, dark gray (uppermost Gaptank ls) 2 bags, one of softer interbeds, one of dark ls. The stream gully on Brooks Ranch 1 mile west of Ranch House

Remarks - It certainly isn't like P. King mapping.

Sect. 13b- 13c- 13d- 13e- 13f- 13g- 13h- 13i- 13j- 13k- 13l- 13m- 13n- 13o- 13p- 13q- 13r- 13s- 13t- 13u- 13v- 13w- 13x- 13y- 13z- 13aa- 13ab- 13ac- 13ad- 13ae- 13af- 13ag- 13ah- 13ai- 13aj- 13ak- 13al- 13am- 13an- 13ao- 13ap- 13aq- 13ar- 13as- 13at- 13au- 13av- 13aw- 13ax- 13ay- 13az- 13ba- 13bb- 13bc- 13bd- 13be- 13bf- 13bg- 13bh- 13bi- 13bj- 13bk- 13bl- 13bm- 13bn- 13bo- 13bp- 13bq- 13br- 13bs- 13bt- 13bu- 13bv- 13bw- 13bx- 13by- 13bz- 13ca- 13cb- 13cc- 13cd- 13ce- 13cf- 13cg- 13ch- 13ci- 13cj- 13ck- 13cl- 13cm- 13cn- 13co- 13cp- 13cq- 13cr- 13cs- 13ct- 13cu- 13cv- 13cw- 13cx- 13cy- 13cz- 13da- 13db- 13dc- 13dd- 13de- 13df- 13dg- 13dh- 13di- 13dj- 13dk- 13dl- 13dm- 13dn- 13do- 13dp- 13dq- 13dr- 13ds- 13dt- 13du- 13dv- 13dw- 13dx- 13dy- 13dz- 13ea- 13eb- 13ec- 13ed- 13ee- 13ef- 13eg- 13eh- 13ei- 13ej- 13ek- 13el- 13em- 13en- 13eo- 13ep- 13eq- 13er- 13es- 13et- 13eu- 13ev- 13ew- 13ex- 13ey- 13ez- 13fa- 13fb- 13fc- 13fd- 13fe- 13ff- 13fg- 13fh- 13fi- 13fj- 13fk- 13fl- 13fm- 13fn- 13fo- 13fp- 13fq- 13fr- 13fs- 13ft- 13fu- 13fv- 13fw- 13fx- 13fy- 13fz- 13ga- 13gb- 13gc- 13gd- 13ge- 13gf- 13gg- 13gh- 13gi- 13gj- 13gk- 13gl- 13gm- 13gn- 13go- 13gp- 13gq- 13gr- 13gs- 13gt- 13gu- 13gv- 13gw- 13gx- 13gy- 13gz- 13ha- 13hb- 13hc- 13hd- 13he- 13hf- 13hg- 13hh- 13hi- 13hj- 13hk- 13hl- 13hm- 13hn- 13ho- 13hp- 13hq- 13hr- 13hs- 13ht- 13hu- 13hv- 13hw- 13hx- 13hy- 13hz- 13ia- 13ib- 13ic- 13id- 13ie- 13if- 13ig- 13ih- 13ii- 13ij- 13ik- 13il- 13im- 13in- 13io- 13ip- 13iq- 13ir- 13is- 13it- 13iu- 13iv- 13iw- 13ix- 13iy- 13iz- 13ja- 13jb- 13jc- 13jd- 13je- 13jf- 13jg- 13jh- 13ji- 13jj- 13jk- 13jl- 13jm- 13jn- 13jo- 13jp- 13jq- 13jr- 13js- 13jt- 13ju- 13jv- 13jw- 13jx- 13jy- 13jz- 13ka- 13kb- 13kc- 13kd- 13ke- 13kf- 13kg- 13kh- 13ki- 13kj- 13kk- 13kl- 13km- 13kn- 13ko- 13kp- 13kq- 13kr- 13ks- 13kt- 13ku- 13kv- 13kw- 13kx- 13ky- 13kz- 13la- 13lb- 13lc- 13ld- 13le- 13lf- 13lg- 13lh- 13li- 13lj- 13lk- 13ll- 13lm- 13ln- 13lo- 13lp- 13lq- 13lr- 13ls- 13lt- 13lu- 13lv- 13lw- 13lx- 13ly- 13lz- 13ma- 13mb- 13mc- 13md- 13me- 13mf- 13mg- 13mh- 13mi- 13mj- 13mk- 13ml- 13mn- 13mo- 13mp- 13mq- 13mr- 13ms- 13mt- 13mu- 13mv- 13mw- 13mx- 13my- 13mz- 13na- 13nb- 13nc- 13nd- 13ne- 13nf- 13ng- 13nh- 13ni- 13nj- 13nk- 13nl- 13nm- 13nn- 13no- 13np- 13nq- 13nr- 13ns- 13nt- 13nu- 13nv- 13nw- 13nx- 13ny- 13nz- 13oa- 13ob- 13oc- 13od- 13oe- 13of- 13og- 13oh- 13oi- 13oj- 13ok- 13ol- 13om- 13on- 13oo- 13op- 13oq- 13or- 13os- 13ot- 13ou- 13ov- 13ow- 13ox- 13oy- 13oz- 13pa- 13pb- 13pc- 13pd- 13pe- 13pf- 13pg- 13ph- 13pi- 13pj- 13pk- 13pl- 13pm- 13pn- 13po- 13pp- 13pq- 13pr- 13ps- 13pt- 13pu- 13pv- 13pw- 13px- 13py- 13pz- 13qa- 13qb- 13qc- 13qd- 13qe- 13qf- 13qg- 13qh- 13qi- 13qj- 13qk- 13ql- 13qm- 13qn- 13qo- 13qp- 13qq- 13qr- 13qs- 13qt- 13qu- 13qv- 13qw- 13qx- 13qy- 13qz- 13ra- 13rb- 13rc- 13rd- 13re- 13rf- 13rg- 13rh- 13ri- 13rj- 13rk- 13rl- 13rm- 13rn- 13ro- 13rp- 13rq- 13rr- 13rs- 13rt- 13ru- 13rv- 13rw- 13rx- 13ry- 13rz- 13sa- 13sb- 13sc- 13sd- 13se- 13sf- 13sg- 13sh- 13si- 13sj- 13sk- 13sl- 13sm- 13sn- 13so- 13sp- 13sq- 13sr- 13ss- 13st- 13su- 13sv- 13sw- 13sx- 13sy- 13sz- 13ta- 13tb- 13tc- 13td- 13te- 13tf- 13tg- 13th- 13ti- 13tj- 13tk- 13tl- 13tm- 13tn- 13to- 13tp- 13tq- 13tr- 13ts- 13tt- 13tu- 13tv- 13tw- 13tx- 13ty- 13tz- 13ua- 13ub- 13uc- 13ud- 13ue- 13uf- 13ug- 13uh- 13ui- 13uj- 13uk- 13ul- 13um- 13un- 13uo- 13up- 13uq- 13ur- 13us- 13ut- 13uu- 13uv- 13uw- 13ux- 13uy- 13uz- 13va- 13vb- 13vc- 13vd- 13ve- 13vf- 13vg- 13vh- 13vi- 13vj- 13vk- 13vl- 13vm- 13vn- 13vo- 13vp- 13vq- 13vr- 13vs- 13vt- 13vu- 13vv- 13vw- 13vx- 13vy- 13vz- 13wa- 13wb- 13wc- 13wd- 13we- 13wf- 13wg- 13wh- 13wi- 13wj- 13wk- 13wl- 13wm- 13wn- 13wo- 13wp- 13wq- 13wr- 13ws- 13wt- 13wu- 13wv- 13ww- 13wx- 13wy- 13wz- 13xa- 13xb- 13xc- 13xd- 13xe- 13xf- 13xg- 13xh- 13xi- 13xj- 13xk- 13xl- 13xm- 13xn- 13xo- 13xp- 13xq- 13xr- 13xs- 13xt- 13xu- 13xv- 13xw- 13xx- 13xy- 13xz- 13ya- 13yb- 13yc- 13yd- 13ye- 13yf- 13yg- 13yh- 13yi- 13yj- 13yk- 13yl- 13ym- 13yn- 13yo- 13yp- 13yq- 13yr- 13ys- 13yt- 13yu- 13yv- 13yw- 13yx- 13yz- 13za- 13zb- 13zc- 13zd- 13ze- 13zf- 13zg- 13zh- 13zi- 13zj- 13zk- 13zl- 13zm- 13zn- 13zo- 13zp- 13zq- 13zr- 13zs- 13zt- 13zu- 13zv- 13zw- 13zx- 13zy- 13zz

7/12/57

Section 13b- Below unit 1 of section 13, there is an exposure of gray-brown shales and orange sandstones. Whether this is a zone in the Gaptank or the illusive Uddenites zone is the major concern. The field evidence today would suggest to me it is a zone in the Gaptank - (distance between shales, dip 10° to 15°)

1) Ls, dark gray, organic fragmental, mostly brachiopods and crinoids - 25'

2) Covered 20'

3) Ls, yellow weathering, dark gray fresh surface, organic fragmental - see collection 7/12/57/2 1'

4) Covered 12'

5) Ls, black to dark gray, organic black - 1 1/2'

6) Covered - 28' probably mostly of #5 lith.



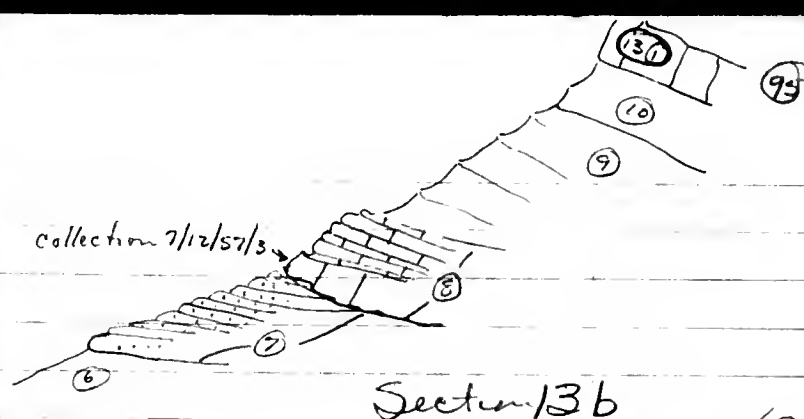
(94)

Sandstone, light  
 7) Calcareous, orange-brown weathering, ~~much~~  
~~fine~~ quartz; coarse bedding, sizes not  
 well sorted, probably glauconitic deposition  
 This unit appears to be truncated to the  
 next by unit #8. 21'; in 6" to 3'  
 beds

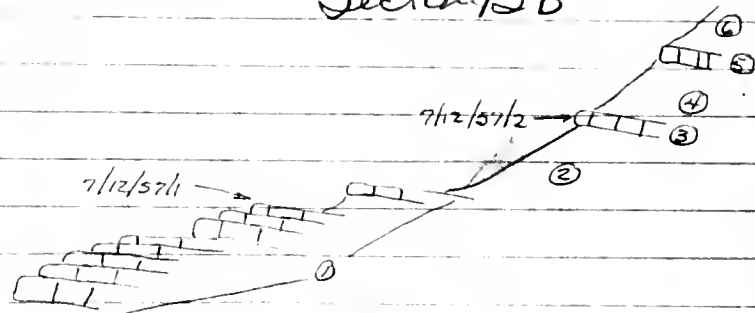
8) Ls, dark gray, organic fragmental  
 very uneven lower bedding plane, 3' to 5'  
 of relief cut into truncated edges of #7  
 11'

9) Alternation of Calcareous and brown gray  
 shale, Calcareous become very fine  
 pebble coars higher in unit; 55' to 60'  
 interval is badly covered.

10) Covered, 40' to base of section 13a unit #11.



Section 13b





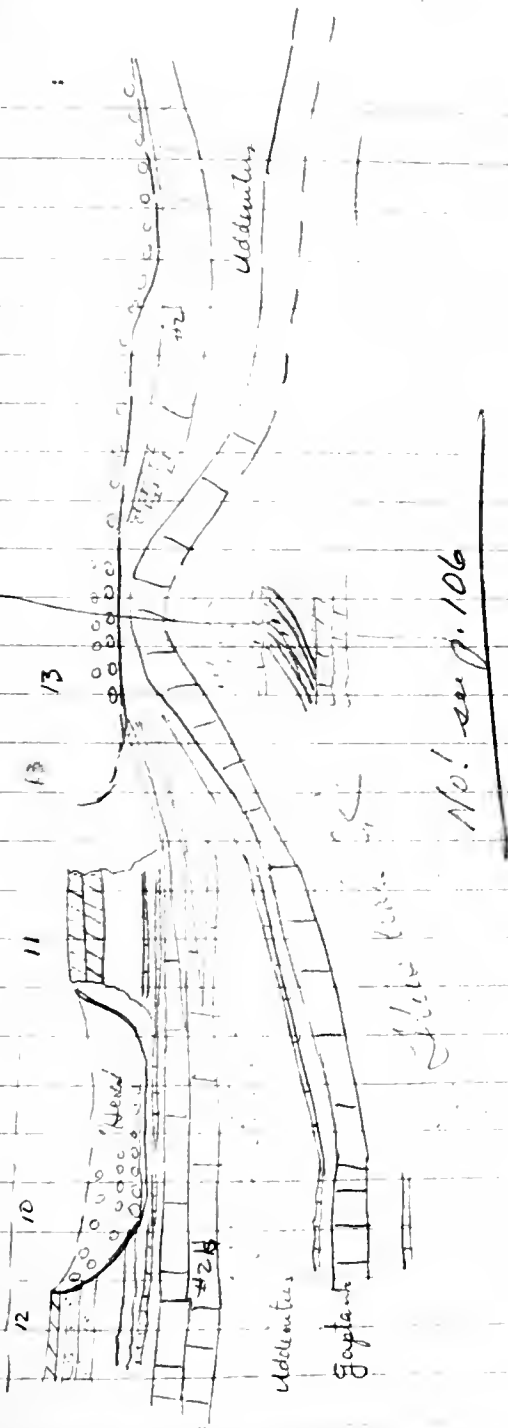
(96)

NE

Condy Brooks Ranch

SW

Section



34

Sect. 34 (part)

(97)

[see p. 163 of No. 2]

Section 14 3/8 mile west of C. Brooks Ranch House

Covered below-

- 1.) Sandstone, light orange brown weathering,  $\text{CaCO}_3$  cement in part, a few grainy calcite. 6" to 2' to 3' beds - 38'

(see unit 2 section 13b)

- 2.) Shale, gray to brown with 2 beds (1') like "1" 17'

- 3.) Ls, silty & sandy, but abundant fusulinids weather light tan or yellow. Brach shells also abundant. In 3" to 6" bed, uneven bedding surfaces. 29' 7/11/57/4 No. 1 7/28/58/1 chucksaugus 7/12/57/4

- 4.) Covered, 55': If other side of gully is compared, this interval is a massive calcarenite, gray weathering with indistinct 6" to 6' beds. It caps that ridge but not the one the section climbs. (Fault?)

- 5.) Ls, gray mottled colors, darker "pebbles?" in a lighter matrix; 1 1/2' to 3" beds irregular bedding planes 18'



(98)

6) ls, gray massive, 44' crinoid fragments, brachiopod shells

7) "Hess" Congl. about 10' above this last unit ⑥. This is on a dip slope so it is difficult to set the interval between the top of ⑥ & the "Hess" congl., but it is within the 10'.

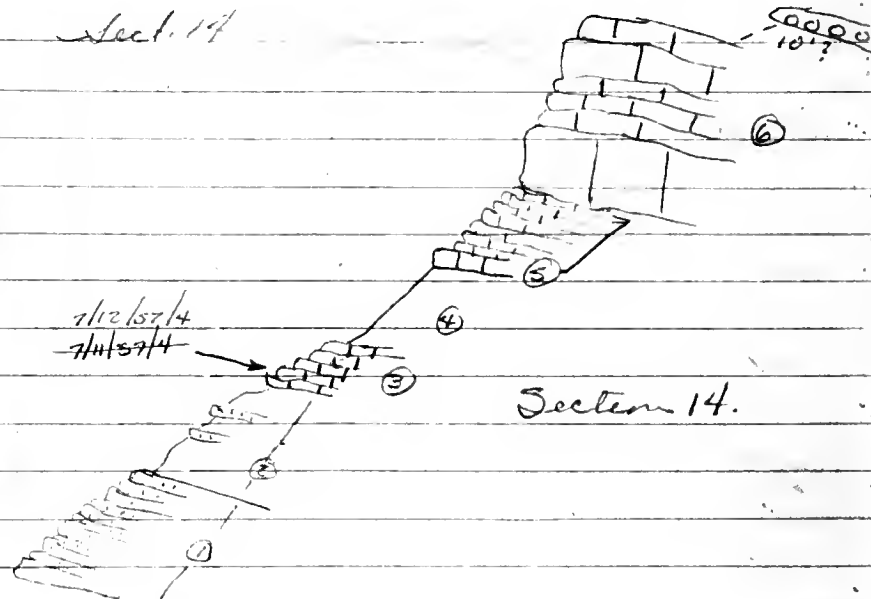
Along the front of the central segment of the Brooks Ranch Wolfcamp ridge most of the draws are the result of erosion in the zone of weakness caused by faulting. These faults have throws of 10' to 50'. The ls. ledges back of the ridge have several zones of slicken sides which I interpret as movement on bedding planes as the Wolfcamp was tilted during later ~~post~~ Marathon basin movement. Probably post K although I have no direct evidence for the time of movement. The faulting perpendicular to strike cuts the Hess & Leonard so that it aids in draw-forming there also. The movements of K caps are apparently restricted to differential movement on

(34)

see also p. 163 &amp; book 2

(99)

Sect. 14



These faults can be explained in this manner.

The evidence in section 13 suggests that the Gaptank and the Wolfcamp limestones either converged and form a combined mass of 15, or that the Wolfcamp is lacking. The study of sect. 14 indicates there is more to this than at first meets the eye. I believe, based only on lithology, that unit 3 of section 14 is the same unit as #1 of section 13a. The #12 ledge of section 14 are probably the same as led 12 of 13b. The #8 ledge of 13b may





however, is equal to the #3 beds of section 14.

The problem is, may tell us the answer, but if the middle of Section 13b is the Uddenites zone, what happens to the Gaptank. Is section 11 and section 13? or what I've been calling Gaptank in the western part of the Brooks Ranch really huge "2" beds in the W.C.H.S.? You know, Charlie this could be confusing!

Another question is what is the red-brown or intestinal which sometimes places seems to separate the massive Wolfcamp limestone (Key "2") and the "Ness" conglomerate (which is of limestone at its base). I suspect the upper dolomite in section 11 is equivalent to the Conglo.

7/13/57 - Went to El Paso to meet John Pope (Navajo '51) (Mich. 56.115) (Cincinnati) and his wife.

Charles Markin & Pete Roux left on the 12th for Austin, they were instructors at U.T. field camp, Leary's Ranch.

7/16/57

(34)

Section 15a -  $\frac{3}{8}$  mile NE of road into central valley on Brooks Ranch. (10° dip, N60W)

Gaptank?

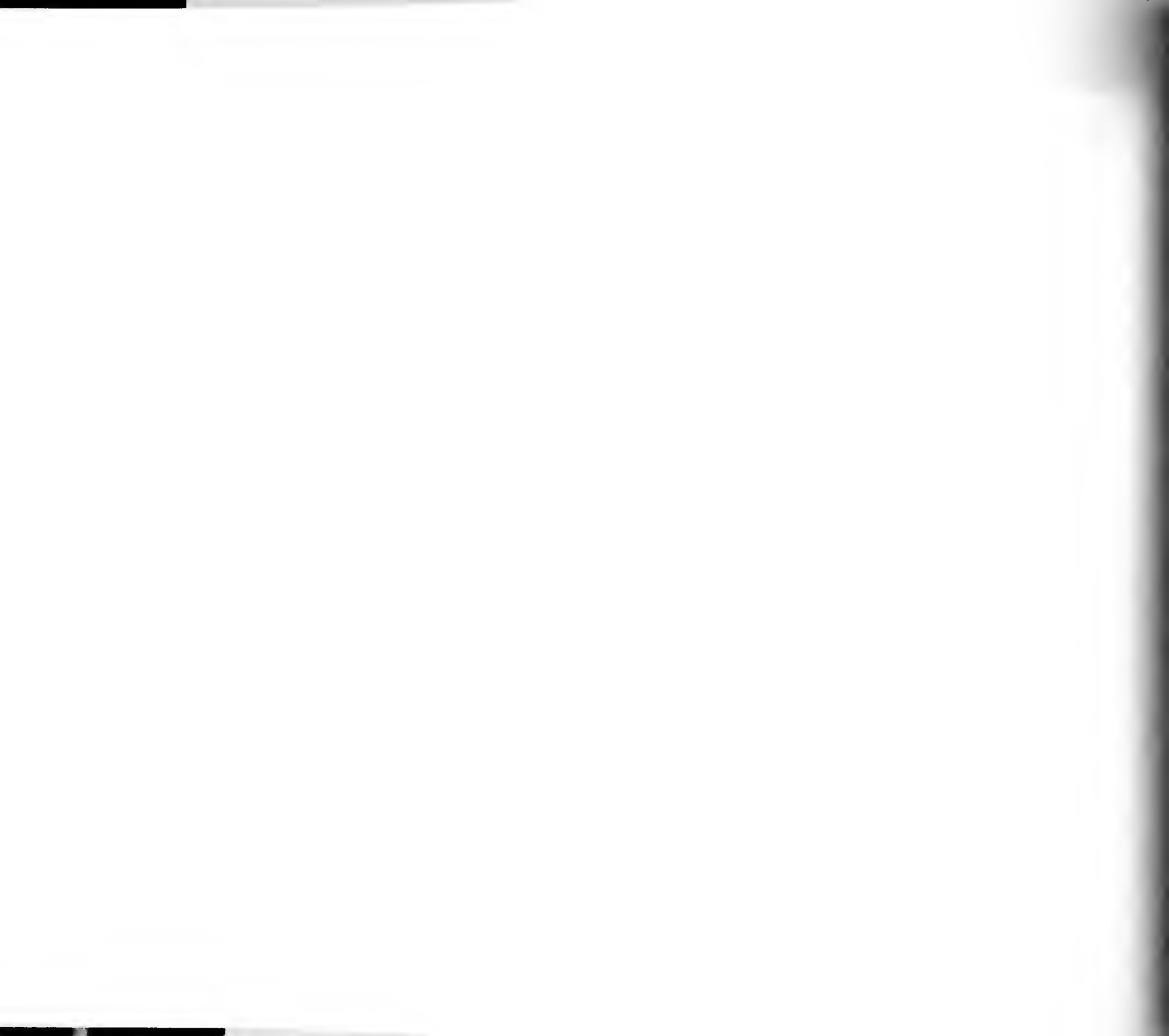
1.) Ls, dark brown-gray, very fine striae, fine lines, some beds gray to gray tan, this exposure is one of several small isolated rubble heaps out from foot of cliff. This pile of Ls is not bedded, but appears to be more or less in place. If the pebbles are Gaptank in age then I believe it is safe to consider this outcrop in place. More than 5'

Collection 7/16/57/1 [Leonard Sch. crinitiformis]  
1-64 C.R.

2.) Covered 83'

3.) Shale, light gray (in part covered), 7 or 8-2" to 3" sand and silt (sand (Quartz) bands scattered in upper half of unit; 28' 7/16/57/2

4.) Sandstone, Orange brown weathering, med quartz sand, with silt fragments of pebbles (4 to 6" Brachiopods, crinoid stems, nautilus, goniatites wood fragments. 2'



5.) Shale, gray to bluish greenish gray, 4 or 5-1" v.f. sandstone bands, 10'

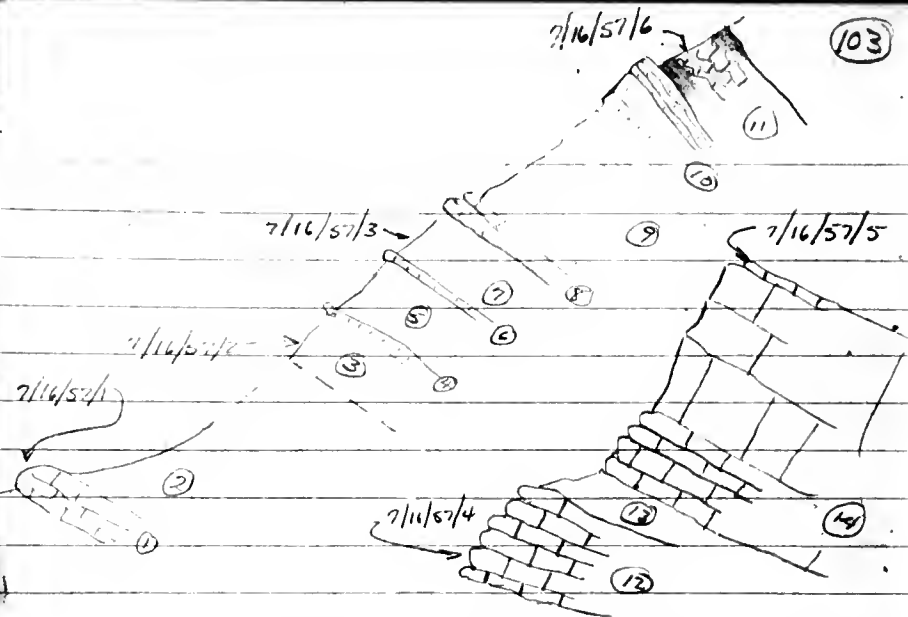
6.) Sandstone. Disconform weathering, fine grained, sand size with Ca carbonate cement. A few wood fragments. The lower 1' of this unit is light green gray weathering, sand size is the same; difference is due to the amount of green oxide with the CaCO<sub>3</sub> cement. 8'

7.) Shale, greenish gray, a few 1/2" v.f. sandstone horizons. (7/16/57/3) 27'

8.) Sandstone, a little more weathering, v.f. sand size, much silt - 30%; brachiopods, woods, crinoid stems; 2 to 3" beds 3'

9.) like 7 in lower part, gradually, upwards, the lithology of unit 8 becomes dominant, beds 3" to 4" in the sandstone: 46'

10.) Sandstone, light brown weathering, (3' of gradualal beds at base to this unit into the bluish shale at top: #11. 6" to 2' of bedding: 19'



11.) Covered 23', probably bluish gray shale with <sup>possibly</sup> fine ~~limestone~~ bed 8" thick, uneven nodular bedding surfaces, small, bryozoan, crinoid base collection 7/16/57/6

12.) LS, gray weathering, massive beds, blackish weather rounded, (not angular) This unit has wavy bedding surfaces and seems to represent a ~~large~~ accumulation of dumped debris 6" to 8' beds, 7/16/57/4 32'

13.) Covered 8' probably same as 12

14.) LS, light brown weathering, cliff former, 2' to 15' beds, massive weathering as a unit along most of this ridge. 3' to top of ridge.



Section 15b - down dip slope and across  
draw and up to a point which is lithologically  
similar - in the correct attitude to be  
bed #4 of section 15a.

15) Covered 7' Gray-green shale, green part

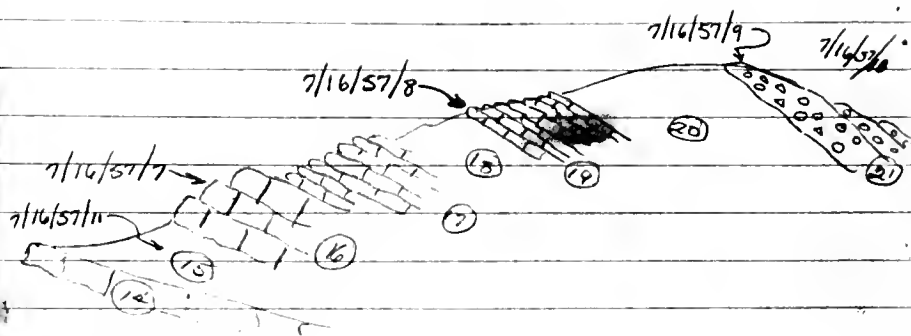
16) Ls, gray (light green tint) nodular, wavy  
bedding 7' 7/16/57/7

The upper 6" to 1" of this unit is now calciche.  
The calciche becomes less dominant after  
that. This seems to have been a horizon  
of higher porosity that ciches that above  
or below.

17) ~~At the Conglo~~ Calcarenite, all of about  
same size, probably broken debris  
dyscol - 16' no fossils apparent.  
3-5' beds - gray weathering, like 12

18) Covered, 10'

19) Calcarenite + organic fragmental 8" to 3" beds  
Crinoid stems + fusulines. 7/16/57/8  
12' weathers pink brown to reddish brown  
very uneven bedding,



20) Covered, 16'

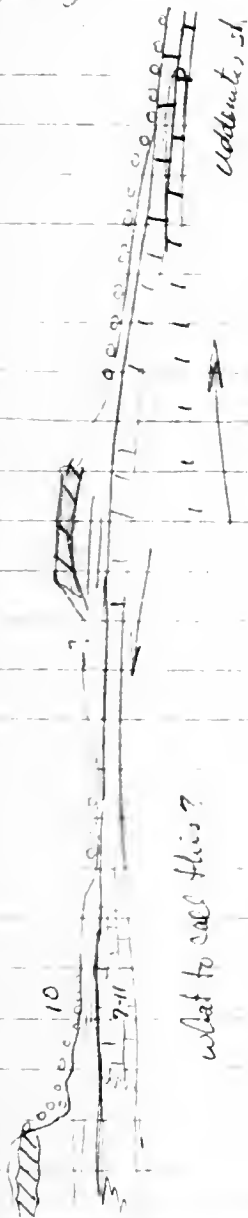
21) "Conglo, New", 7/16/57/9 - a collection of cobbles  
from lowest exposed bed. Many shades of Ls,  
dark gray nearly black to light gray, white  
+ black cherts, 7/16/57/10 - fusulines in with  
the fines of the congl.  
about 110' thick



(106)

Today picture on page 96 looks like this of we ca.  
 accept Kuge age on the #1 but easy section 10, page  
 76.

I believe the Near Cngs is a running pocket beach.  
 The dolomite strata probably of we age and is exposed  
 to surface weathering.



what to call this?

40

Sec. 40

107

[see p. 137 of NB. 2]

7/17/57 - Allison Ranch gas tank area -

The manner in which the gas tank is covered is striking. They seem to originate in the "Uddenites" zone and thicken rapidly to the east and then thin to disappearance. I wonder whether this Uddenites zone is even approximately equivalent to that of the "type" area (WCHS)

Section 16, North of Highway along Allison-Moon  
 Fence Due North -

Covered below -

3) Sandstone, 70% or more quartz,  $\text{CaCO}_3$  cement.  
 Brown Orange weathering, med ( $\frac{1}{8}$  to  $\frac{1}{4}$ ") lamellae, even-  
 not irregular: in beds 3" to 1', some beds are composed  
 of many small shell fragments -

1) Ls. brown yellow weathering, organic fragmental -  
 Brachio, large corals, crinoids, sponges, fusulina  
 coll. 7/17/57/1 5 1/2'

2) Covered 21'

3) and I anticipate this to be a littoral deposit, has  
 whole shells of punctate brachio 7/17/57/2.

[12']





(108)

4.) Covered, 2 or 3 - 6" bands of brown-orange weathering sandstones. Collection 7/17/57/3 from out hills 34'

5.) LS, dark gray weathering, organic fragmental crinoids & brachs mainly. 7/17/57/4 at 38'  
3" to 2' beds 61' (Transfer and 2)

6.) Covered, 66'

7.) LS, dark gray, with large amounts of orange-brown quartz sandstone in between ~~irregular~~ LS masses. 8' 7/17/57/5

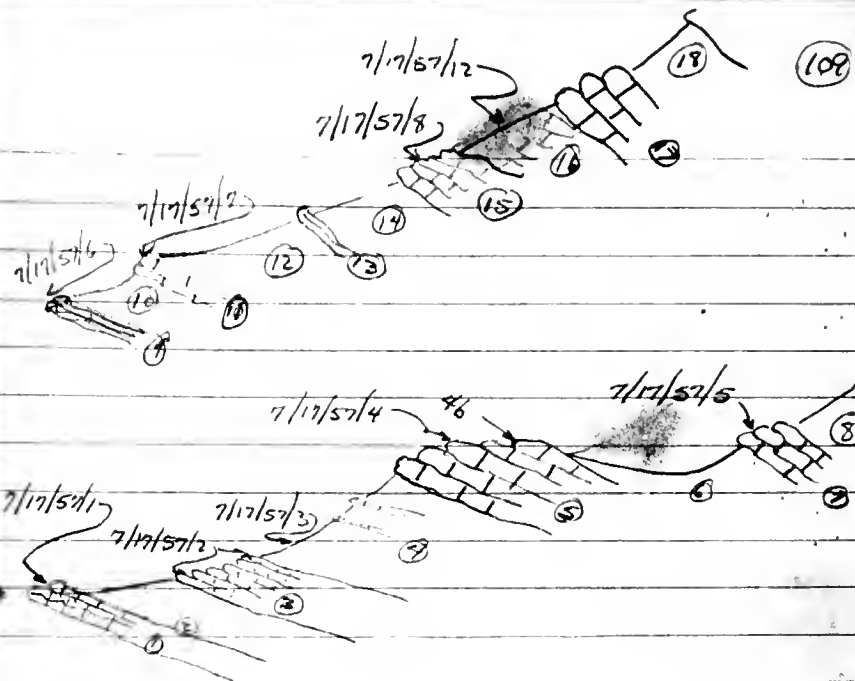
8.) Covered, 13'

9.) Calcareous and SS., dark gray weathering, dark gray, on fresh surface. 3 1/2' 2" to 6" beds. 7/17/57/6

10.) Covered, 10'

11.) LS, weathers orange-brown, fresh, brown-dark gray. Shell hard, fusulines, crinoids & brachs. 6" to 1' beds [4'] 7/17/57/7

12.) Covered, 13'



13.) Sandstone - orange-brown weathering, fine sandstone, laminated - see color picture 6" - 8"

14.) Covered, 22'

15.) LS, med. gray weathering, fine grain Calcareous, many silicified brachiopods, collection 7/17/57/8 about 4' above base - crinoids common 6'

16.) Covered, but probably like #15 - 38' to the east becomes a gray green shale about 20' to be more than the measured 38' 7/17/57/12



(110)

17) Ls, gray-brown weathering, platy frag. of shells, mostly  
 brachiopods. 1' to 2' thick overall weathering  
 creamy - 7'

18) Covered 21'

19) Ls, (calcareous) with some quartz 10-25%,  
 cherty, smallish pebbles 1% or less; weathers  
 a more brown gray, whitish specks - wavy  
 uneven bedding, 1" to 2" thick;  
 55' the upper 40' become very  
 quartzitic - about 85-95% SiO<sub>2</sub> excluding  
 cement. Becomes more cemented upwards

20) Covered, 15', probably like unit 19  
 see note page 112. 8/22/58/7 and  
 7/17/57/9

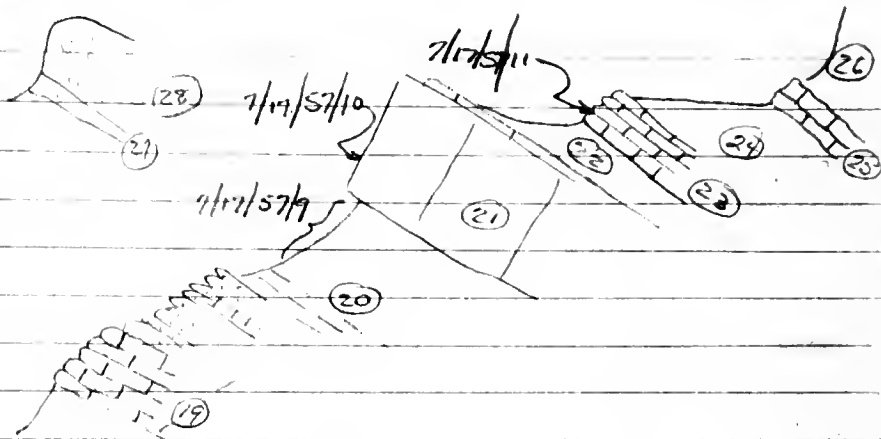
21) Ls, massive, brownish-gray weathering;  
 inclusion bedding 6" to 1' intervals, but  
 not much "true" bedding 31'  
 broken up - e.g., very light gray on fresh surface.  
 very fine grained, possibly mostly micr. crystallized?

22) Covered, 9'

see 8/22/58/6

23) Ls, brown gray weathering, dark gray  
 on fresh surfaces.

(111)



uneven bedding 2" to 6" wide, crinoidal  
 material common, 12'

21, Covered, 20'

25) Ls, weathers orange brown, has brown (iron stain)  
 chert nodules - 9'

26) Covered, 36'

27) Sandstone, quartz, gray, med.; calcareous  
 cement. Brown + green grains, chert + quartz  
 pebbles (1/4" dia. to 1/2"). Some massive,  
 some in 1/4" laminae. 3'

28) Conglo.; has same sand as 27, just  
 that pebbles become 4" to 8" diam and comp  
 to about 75 to 80% of lithology.



There is almost no ls in this cngls, but it still seems to be the "New" cngls. The other beds ls down at cobbles as high as 10%.

#20 In the stream down interval 20 is exposed. Calcareous shale + siltstone, rich in fossils. free in slope wash. Collected 7/17/57/9. White to light cream weathering. Becomes more calcareous and grades 2-3' into many bedded layer to biohermal reef. 35'-40' ~~at base~~

The "4" + "5" of King's Gap tank appear to have b-garages in the "Uddenites" zone just to the west of Gap tank. I find no good evidence which would assign a Weycamp age to King's beds in this area. It is not until we get above that unit that we find a distinct break in lithology.

7/18/57 -

East of Texas Highway 51, beds of what I believe are Weycamp age (at least lithology) are folded and faulted quite badly. The axis of a syncline strikes N74W from peak of K on NW side of head up a valley in E on St. Soley road.

Slides read 7-18-57-11

7/18/57/1 is from a sandstone in the creek in this region.

This syncline is probably due resulting from faulting NE of locality 7/18/57/1

50 yds NE of locality 7/18/57/1, beds are on end, probably another fault, not so severe. These structures predale K although the K is faulted & faulted (1' thrust in this zone of weakness).

This little area is very complex - 2 sets of faults; one N74W or so and one N36S or E.









The first does not recognize the complicated structure of the gap zone. I believe there #10'S westward is in the same set, faulted into 2 portions. The NW-SE fault is to the west, and the E-W fault is to the east. The main fault is thicker than they are normally.

The contact between the ~~easternmost~~ "upper" Wolfcamp contains Tenney (H. H. Tenney) fossils. The Tenney is very dark, the Tenney layers are quartzites.

The Massena's side of the Wolfcamp seems to be continuous with bed 3, section 17, but faulting may make the picture more complicated.

The rock like the one, answer to the question is just over to place these things in the section 17.

The ~~rock~~ would suggest it is a ~~rock~~ called ~~Massena~~, but the ~~rock~~ is ~~very~~ similar to the upper Wolfcamp. ~~It~~ ~~is~~ ~~very~~ ~~similar~~ ~~to~~ ~~the~~ ~~upper~~ ~~Wolfcamp~~.

~~It~~ ~~is~~ ~~very~~ ~~similar~~ ~~to~~ ~~the~~ ~~upper~~ ~~Wolfcamp~~. ~~It~~ ~~is~~ ~~very~~ ~~similar~~ ~~to~~ ~~the~~ ~~upper~~ ~~Wolfcamp~~. ~~It~~ ~~is~~ ~~very~~ ~~similar~~ ~~to~~ ~~the~~ ~~upper~~ ~~Wolfcamp~~.

was about 12 miles? may be - There is one typical Congle of the River before we get into the "river" and then the beds here. Problems!

It will pay to investigate the outcrops in the Canyon south of the Allison Ranch. The "Wolfcamp" may be exposed there, but I really wonder!



7/19/27

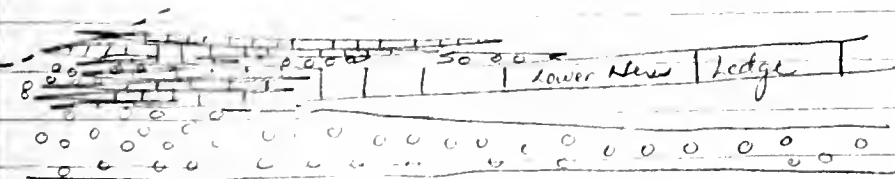
Mr. Moore was at a home (Ranch), lives in Midland.

## Deer Ranch.

The congl. lithology C.O.D. pointed out as Wolfcamp since the main interval out to the SW. The broken or irregular Jarvis mentioned near the road, I believe are SW extension of the lower Hess ledge. The lower Hess ledge 1/2 mile NE of the first stop contain "Wolfcamp" lith. conglomerates high into the series. The lower Hess ledge is 1' to 3' ls at this SW locality but the lower Hess becomes massive to the NE at the upper ls of this interval gradual thinned within 1 1/2 miles to the NE. The conglomerates below look like those

SE

NW



within the Hess (lower) ledge. At this SW locality I believe Jarvis has overlain the upper Hess ledge for the lower Hess ledge.

Collection 4/19/54/1 - a ls cobble in the Wolfcamp Congl. From a fine place, but apparently from lower 1/2 of exposed Congl. section about halfway between Windkilled and Stop 1



(120)

6

7/20/57

Loc. 120 - SW end of Sennett hills

## Section 18 -

- 1) Congl., basalt. cobbles. matrix of ls. & gray sandstone, gray sandstone, a little more cement.  $CaCO_3$  cement. Not known if the dip is here. The conglomerate is covered, but the conglomerate is sandstone and is the only outcropping rocks - 55' Cobble of Congl. - Collector 7/20/57/10

- 2) Ls, gray sandstone, some micaceous sandstone. Dip about  $10^\circ$  WNW. Zones within this ls. unit are quite conglomeratic. The chief distinction between this & #2 is ls. sandstone & ls. matrix. The conglomerated part is about 2', but x.f. pebbles are present in the ls. higher in the unit. Top of unit is very micaceous, well sorted, forms a 1" plate. Bedding below is 1' to 4'; 52' This unit is equal to lower Hess beds.

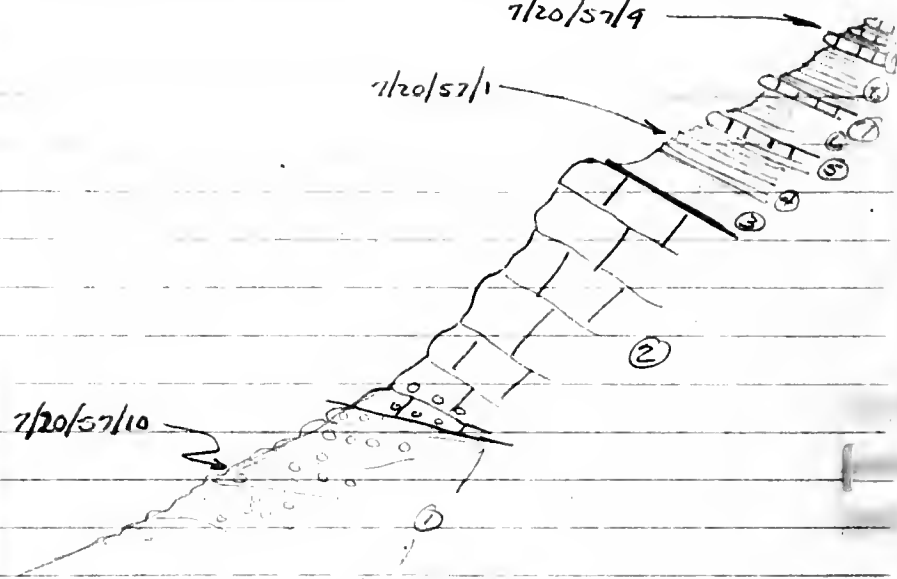
- 3) Covered 1'

(121)

7/20/57/9

7/20/57/1

7/20/57/10



- 4) Substratum of sandstone & micaceous cement. After irregular texture; Siliceous cement is 2" or more 7/20/57/1 11'
- 5) Ls, clastic, with chert pebbles 1', thins to NE thickens to SW
- 6) like #4 5'
- 7) like #5, 1 1/2', thickens to SW
- 8) like #4 6'
- 9) Ls, clastic, 3 beds 4" to 8" thick, each with well sorted flat tops, separated by siltstones; 3' 7/20/57/9



(122)

10.) Covered 3'

11.) LS, congl., sh. <sup>large</sup> pebbles; ls dark sandstone matrix. 1' to 2' beds; Top is same old flat surface, well sorted, and silicified 1/2" to 1". 9'

12.) Covered 1', probably clastic ls, congl.

13.) LS, org. frags, biog. frags, crinoid (stems) brachiopods; 7/20/57/2, 1 1/2'

14.) Covered 5'

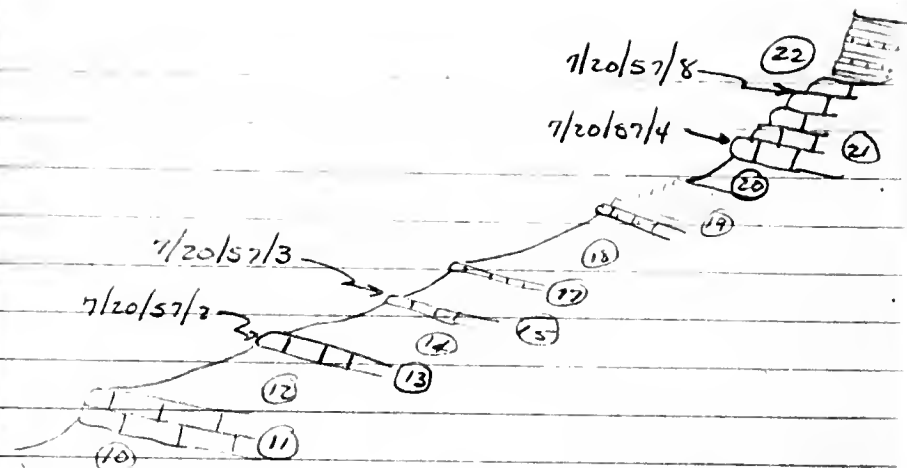
15.) LS, organic frags. 7/20/57/3, rubble at base becoming ~~very~~ well sorted in upper 6", top 1" is ~~very~~ silicified and laminated, top is flat. 2 1/2'

16.) Covered 5'

17.) LS, organic frags & clastics, some small chert granules - a few lines or so, echinoid spine [2']

18.) 11' Covered

(123)



19.) LS, fragmental (organic) and quartz sand matrix, crinoid frags. & brach. shells, become more sandy upwards. 9'

20.) Covered - 6'

21.) LS, clastic, gray weathering like the other lower clastic ls, - has flat top w/ 1" siliceous zone 8" to 1" 7/20/57/4 5 repeats of this lowest unit (at least) in 8" to 3' beds; 18' - some chert chips 7/20/57/8 near top

22.) Sandstone, 1/4" size, weathered light brown thin but uneven laminar. w/ 2, 3" ls. of the #21 type. 9'





(124)

- 23) Ls, clastic + organic frag. gray weathering with a tinge of brown. 2 cyclic beds one (a) 3'; (b) about 4'

Collection 7/20/51/5

Thin tops are eroded + weather a brown iron oxide color. 7'

- 24) Covered, 14'

- 25) Ls, calcareous, both clastic + organic frag. weather gray brown. 1' to 2' beds 12'

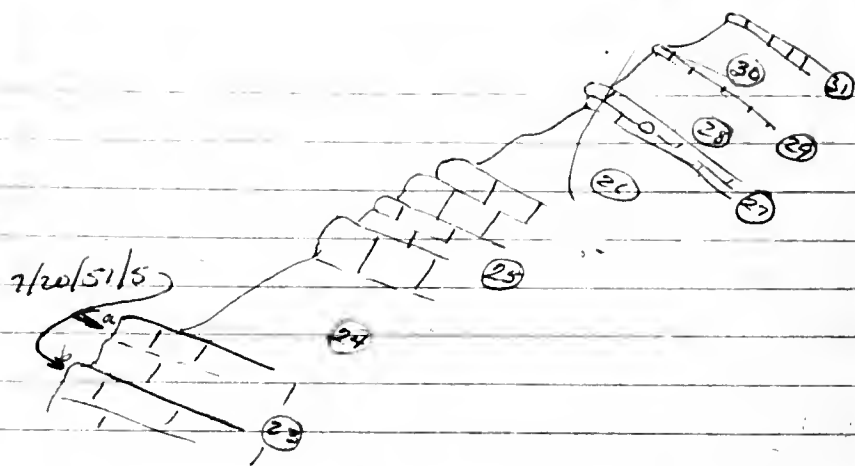
Lamination 2 small channels sp. N 100°

- 26) Covered, 31', probably lt brown v.f. sandstone or siltstone.

- 27) Mar. ? This unit as well addition study.

Marine Rx, no bed except near top in a irregular surface. 2 shades of silty ls; one light brown, one light gray - they occur interlocked with each other - also coarse sandstone chert + ls fragments are twisted and warped throughout these beds. Several kinds of brach shells, bryozoans, a fusulinacean. The entire thickness is a bed of slumped material.

(125)



an over stepped Permian near-shore deposit, a 3" diam pebble is staining at me. 1 1/2'

- 28) 7', lt. brown weathering, v.f. sandstone.

- 29) Ls, gray (dark) clastic, some 1/4" diam chert + quartzite, 1/2" red brown siliceous upper surface. 6" -

- 30) like 28., 8'

- 31) Ls, lt. brown to gray brown weathering; very silty and v.f. so does - an irregular 3" band of very fine pebbles. 1/2' -

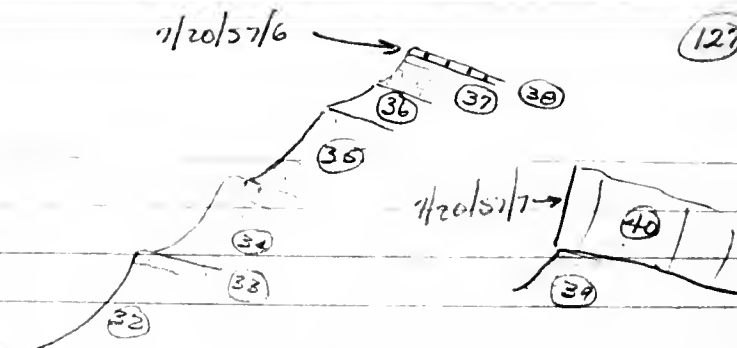
- 32) Covered, 13', probably like "28"



(126)

- 33.) Siltstone, very fine, bluish to brownish gray weathering. 6"
- 34.) Sandstone & siltstone, sandstone top grain grades into a 1' to 1 1/2' lime rich resistant bed. [8']
- 35.) Sandstone, ungrained, bl. brown weathering up to 1" bedding. 23'
- 36.) Covered, 5'
- 37.) same as 36 - 8'
- 38.) LS, gray weathering 8", has little cephalopod at 7/20/57/6
- 39.) Sandstone, ungrained, bl. brown weathering 8'
- 40.) LS. Massive, gray weathering, bihermal, upper Hess ledge

(127)



Collection 7/20/57/7 - a piece of float, found at about bed 34 - area grains as is richer from about #38 or, most likely from #40.

Upper through bed #4 of this section the sequence of lithology is rather cyclic, even the Hess? In the upper part shows cyclic deposition, but with the change in either source of sediment or of depositional environment. I frankly don't know exactly where to draw formation boundaries. The top of bed #1 is at the top of the Wapaccang Congl., the bed #2 limestone below is equal to the lower Hess ledge.

King calls the lower ls ledge Hess, and the upper ledge, the 1st Leonard ls mbr. Section 18 thus includes Wapaccang (part), Hess, and lower Leonard rocks.



7/21/51 Section 19 - up to eastern most  
cliff forming Wegcamp Congl - topped by Hess to City  
Deer Ranch

The lower part of this section is covered and  
is gullied up

no dip

0) Covered - 10'

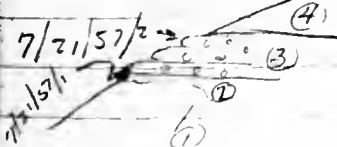
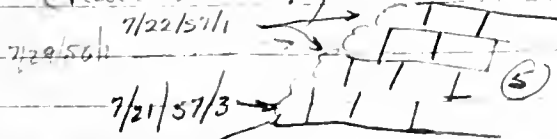
1a) Sandstone - green-gray weathering, much  
green siltstone, 6', Collection 7/21/51/1

2a) Congl., brownish weathering, mostly 1/4" to 1/2"  
chert pebbles, brown sand, some, but few, crinoid  
stem fragments, 5', 7/21/51/2; 2" to 6" beds

3a) Covered, 10'

4a) Ls, mid-gray weathering, bicoloral, no  
distinct bedding, large cephalopods,  
crinoid stems, some green large for  
Penn., could they be Perm? brachiopods - 29'  
Collection 7/21/51/3

(Rained out!)



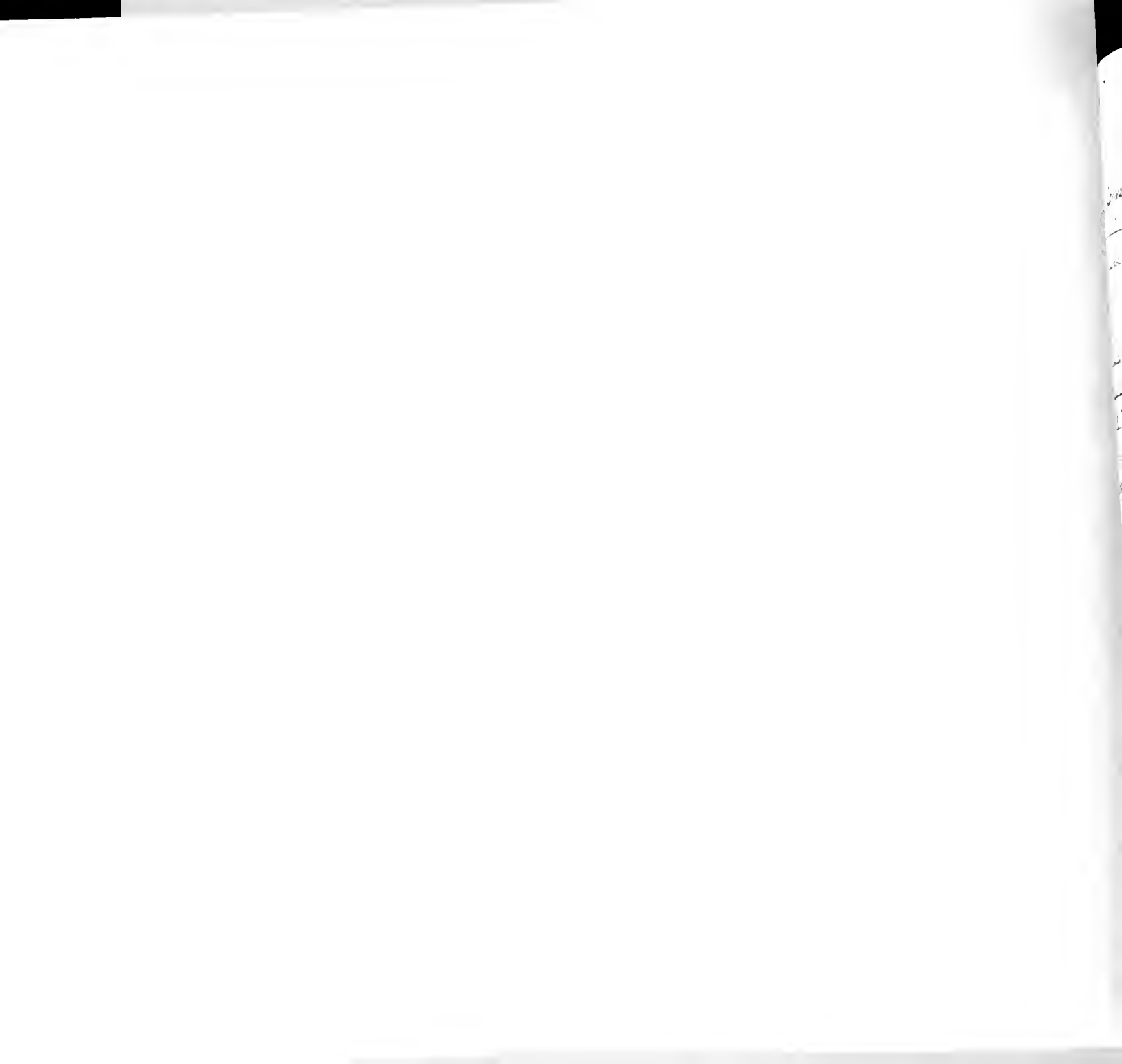
7/22/51

(+ quartzite)  
5a) Ls, w/ 30-40% chert pebbles - gray to gray-brown  
weathering; a few ls pebbles. 3' beds,  
from about middle of unit upwards, large  
ls. cobbles appear, a few horizons are  
nearly sandy, coarse; 46' It should  
be noted that the upper 2/3 of this unit  
could probably best be called a Conglomerate.  
The ls. is nearly completely lacking except  
as cobbles in the upper half. about  
5% or less of the upper rock unit is ls. cement.

6a) Covered for most part, exposures are  
congl, chert + quartzite, ls. cement.  
One big ls. block at 38' (Collection 7/22/51/2)  
145' - I'm separating this as a unit  
only because of the weathering characteristics.

7a) Congl., poorly sorted to no sorting, chert, quartzite,  
ls. pebbles; some small cobbles - lime  
cement. 7' mass, cliff forming. Becomes  
coarser (small to med. sandstone) upwards.  
84', 1' to 20' beds.

8a) Covered - 65' this is probably the extension  
to the west of the green gray shale + calcareous  
lenses.



(130)

9. ~~15~~ Congl.; brown + gray weathering. ls, chert, + quartzite pebbles. brown matrix, not sorted; base is covered. 3' or more. (7/22/57/3)

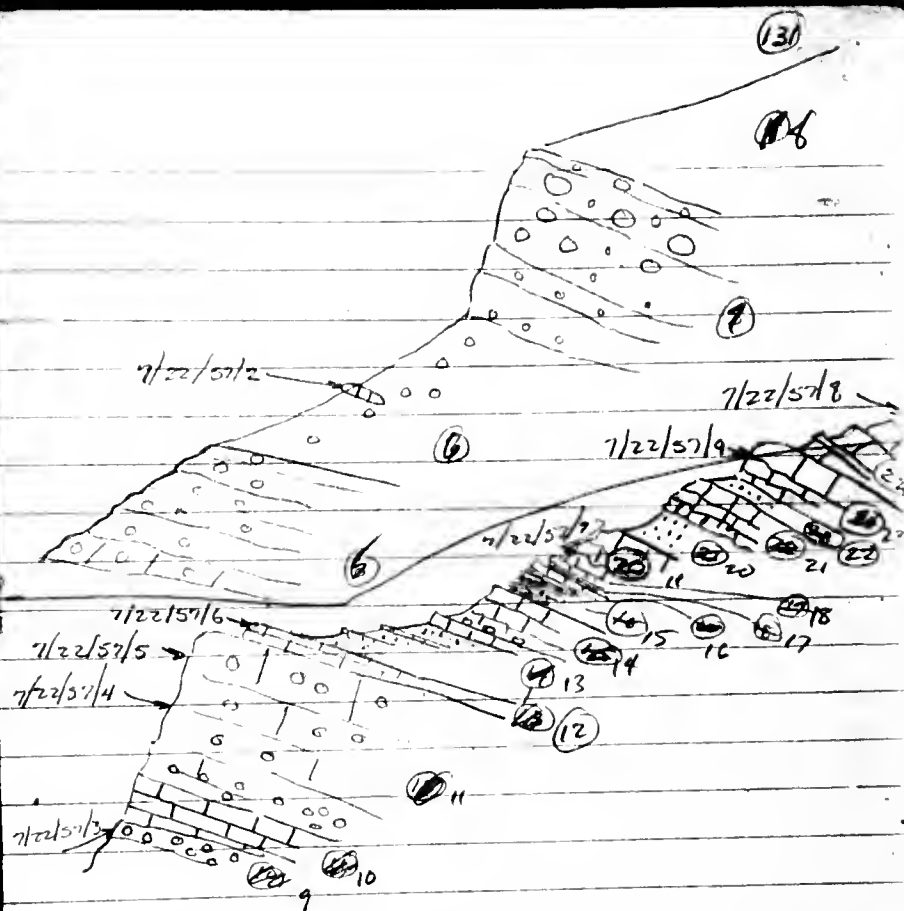
10. ~~15~~ Calcareous, dark brown weathering. zones of pebbles (1070) in calcarenite.

2" to 2' beds. Very irregular channels in top of bed 10; 22' has a flat top. calcareous clastics are dominant.

11. ~~15~~ Consists of 2' of calcarenite; lower 10' of calcarenite. 10' to 12' is made of calcarenite but chert + quartzite clasts are abundant (within 5' of top). (7/22/57/4) 35' up. (7/22/57/5) 43' up. This unit becomes predominantly ls in the upper 10' (750%) has brachiopods, bryozoans, crinoid stems, + corals, besides the fusulines. I think it could be called near biohermal both in formation and position during Pm.

49'

Brown & dark brown gray weathering. Has blocks and small lenses of light brown silt which weathers out. Giving raggy appearance.



12. ~~15~~ Calcareous, mid gray weathering; has granular size organic fragmental, 6' collection 7/22/57/6, 2' beds

13. ~~15~~ Partly covered - apparently alternations of brown silt + sandstone and calcarenites 3 cycles - 6' - 6" to 1' ls.

Calcareous in 12 + 13 have flat top brown siliceous stained.





14<sup>15</sup>) Congl., about 6' grading up into  
a rubble of aigul, sponge, a few fragments  
which may have been *Trinacropora*, covered  
with 6'

15<sup>16</sup>) Sandstone, <sup>light</sup> brown,  $\frac{1}{16}$ " to  $\frac{1}{8}$ " beds -  
7'

16<sup>17</sup>) Ls, Calcareous, with organ frag. granular size,  
1"

17<sup>18</sup>) Sandstone brown - 6'  
notes: here the calcareous is irregular  
at its base and rests on eroded & weathered  
brown sa. dol. (apparently the  
major bed in sedimentation?)

18<sup>19</sup>) like #16 2'

19<sup>20</sup>) Ls, biohermal, gray weathering with  
brown congl. chert pebbles. 7/22/57/7  
6' becomes a calcarenite at the  
top (2') and a flat top surface w/ siliceous  
iron (brown) weathering.

20<sup>21</sup>) Sandstone, brown, like #16 - 4 1/2'

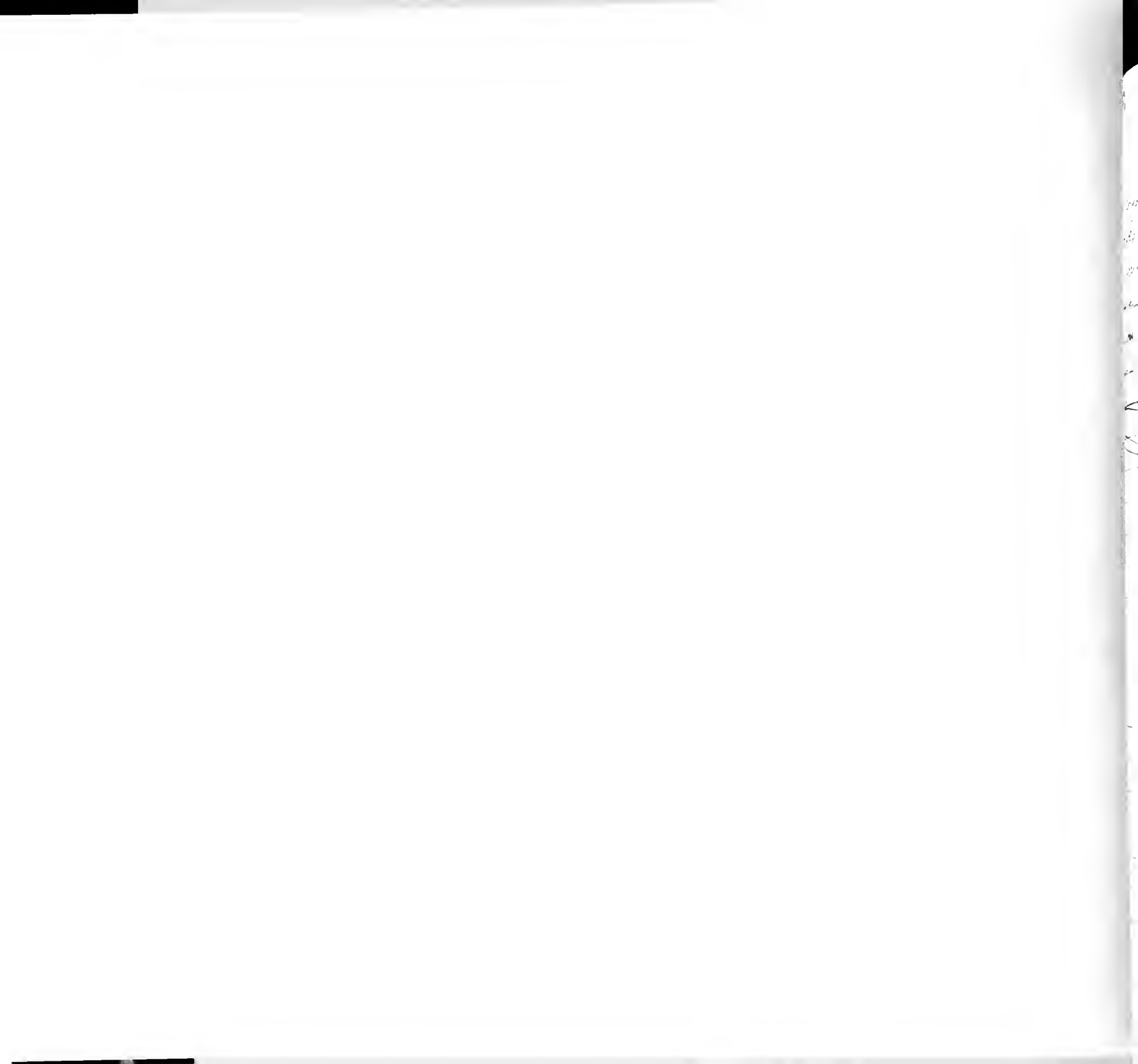
21<sup>22</sup>) Ls, rubble, with chert conglomerate, &  
ls. congl. cobbles: grades into a calcarenite  
(upper 6" to 1') with a flat, siliceous iron  
stained upper surface. Coll. 7/22/57/9  
7 1/2'

22<sup>23</sup>) Sandstone, <sup>st.</sup> brown weathering, much  
coarse calc. <sup>sand</sup> with the fine quartz sand. 2'

23<sup>24</sup>) Ls, massive, brownish gray weathering  
chert pebbles, and ls boulders scattered  
in this. 15'

24<sup>25</sup>) Ls, mostly calcarenites - 4 cycles of  
rubble, through calcarenites, to flat top with  
siliceous iron stained; 21'; (at top 7/22/57/4  
top of ridge)

50' NE of measured section a chert &  
quartzite congl. has cut a 8' channel  
in unit #25. This congl. appears  
very much like unit 8 (in the lower part).



The congl. intervals 1 through 8, thicken  
NEward toward the old iron dry hole. This  
is accomplished by a slight thickening of  
individual beds in that direction, but added  
by off-lap on what are apparently large  
channel meandering.

SW

NE

Sect. 8

[see p. 7 + 143, +

p. 96 of No. 2]

Section 20 -

Wolfcamp over Lee Gap tank angular unconformity.  
Gap tank strike N75W dip 9° NE

Collection 7/22/57/10 + 7/22/57/11 in Gap tank  
at this point.

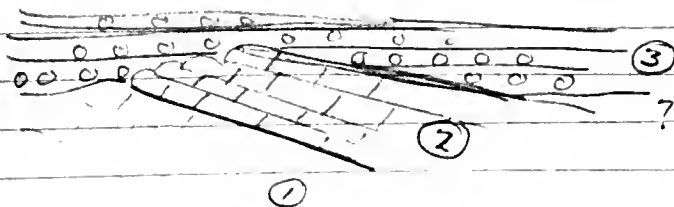
L<sub>3</sub>  
1) yellow weathering, yellow-cream high %  
of silt, shot through with calcite veins.

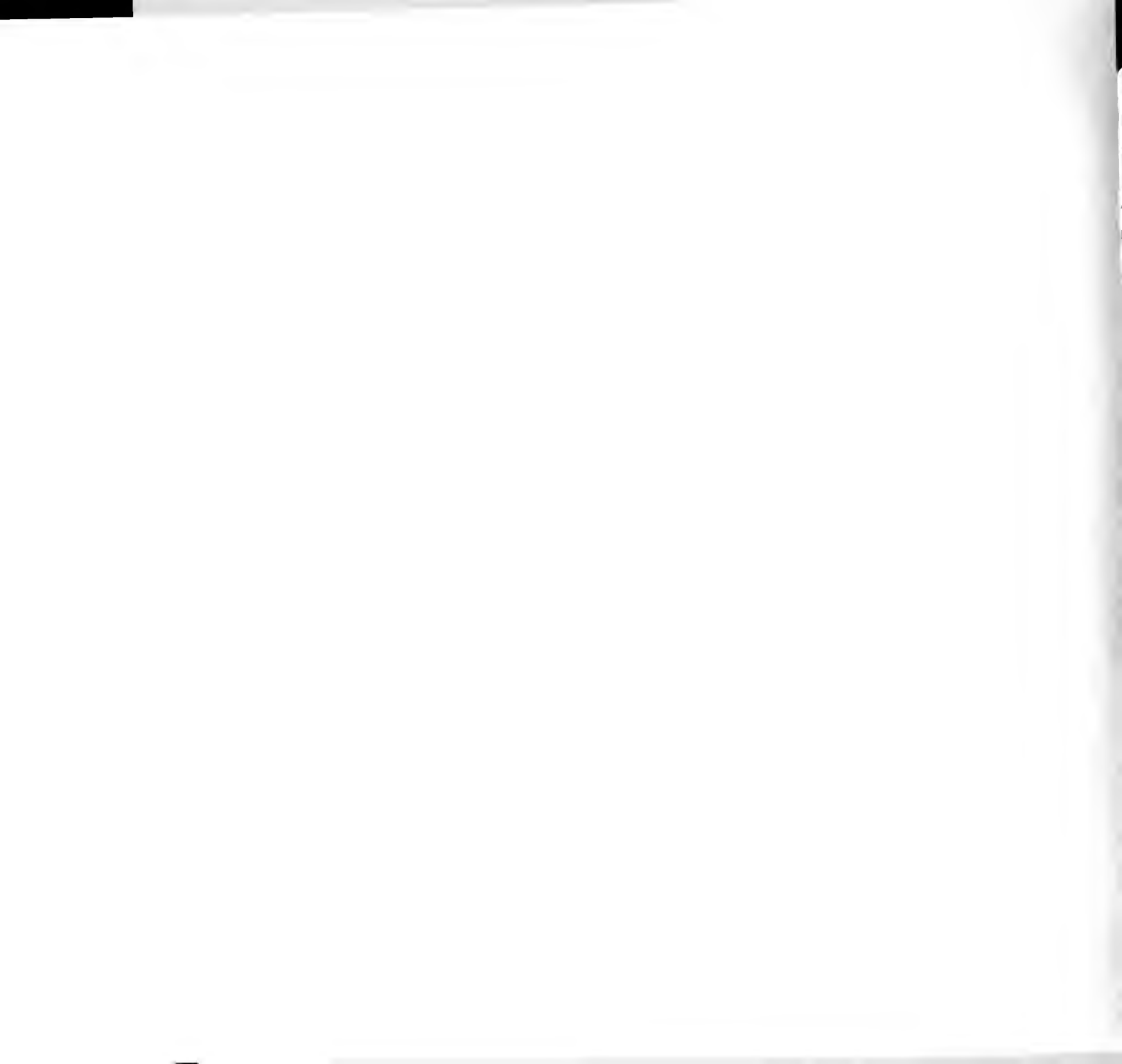
7/22/57/10; 30', covered below

2) L<sub>5</sub>, biohermal, <sup>dark gray to mid-brown,</sup> yellow weathering silt,  
chert pebbles + ls. cobbles, 2 beds,  
14' (coll. 7/22/57/11).

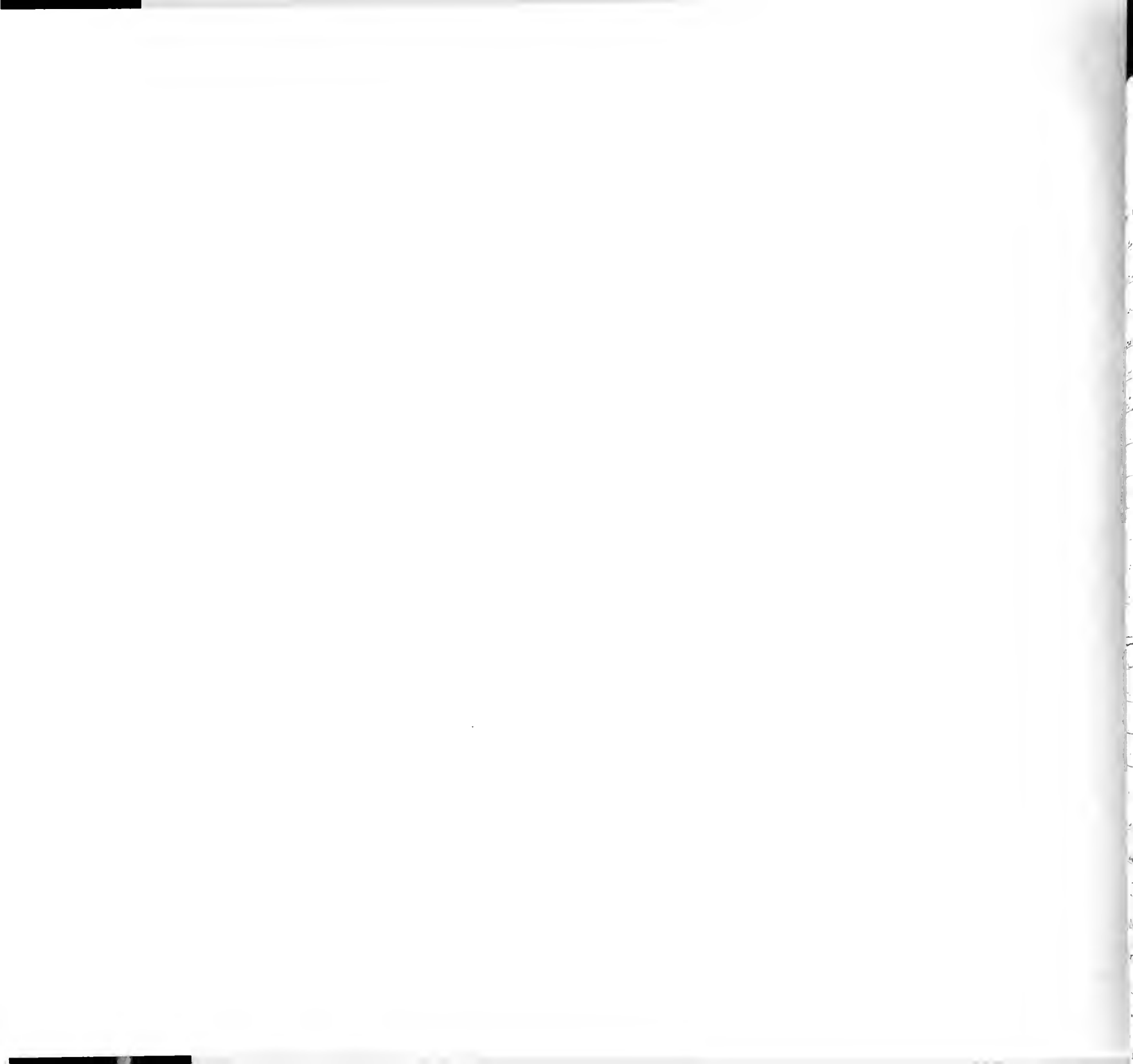
3) Congl., brown weathering. Cherts, quartzites  
and gray ls., brown sand; this unit laps  
up side of a high (top) ... #2 bed and finally  
covers over the top. Strike NO. 30E, dip NW 11°

29'







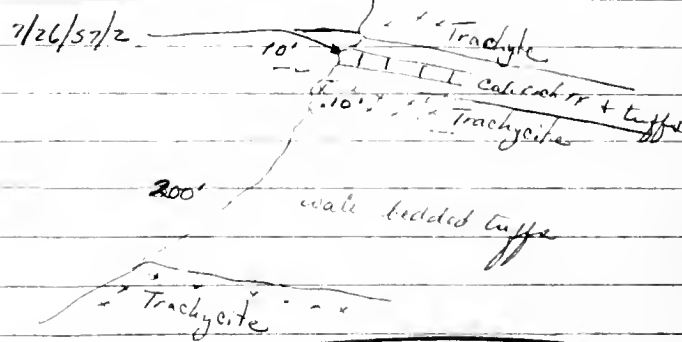


The Hueco appears in Page Swine's area is a dark feldspathic dolomite; Ichnioid ~~spores~~ and some ~~productella~~ ~~facta~~ are silicified fossils dolomitized, but many all other fossils have been destroyed and rather completely lost or lack any structures; just outlines. In the Van Horn Mts. there is about 600-900 ft of Hueco - about 40-50' of Poncha Congl. and transition zone. It is common to the basal conglomerate of the Wagon zone contains siltstones and sandstones, possibly the equivalent to the clastic ls zone, but not the same phase. In Ja is Henderson's area the Hueco is about ~~600~~ 600'-700' in the eastern locality (7/25/57/1) and perhaps thicker in the NE locality (7/25/57/2 + 7/25/57/3). There East 2 localities are near the base of the base of the unit but the exact horizon was not determined. There is some structure complications in this area and so more detailed work is needed. The presence of siltstones, shales and sandstones in the first locality suggest the lower 1/3 a lower 1/3 are not around clear horizon is like the middle 1/3

7/26/57

Coll. 7/26/57/1 from base of <sup>unit</sup> igneous rock - above Boguillas ls (K) - There is a possible freshwater ls in pre-volcanic time. Black Peak east of Wylie Mt.

Coll. 7/26/57/2 - So. of Van Horn about 15; The section, westernmost part -



but rather are near the margin of the basin, probably the SW side. I've promised you to let him know what the ~~findings~~ ~~findings~~ are from the 2<sup>nd</sup> & 3<sup>rd</sup> localities. In general a measured section in this larger region seems to promise little in the way of fossiliferous. See: Baker, et al. Bull. 2745 (?)

455 455 455 455 455 455 455 455 455 455





7/27/57 - W of many hills shown & C. C. area around area.

Collect. 7/27/57/1 - Uddenites zone W. side geologist's Canyon Saddle.

Coll. 7/27/57/2 - Flat, near bed 22, section 4, see page 35

Coll. 7/27/57/3 - see page 52; bed 15, section 6.

~~Coll. 7/27/57/4~~ - Uddenites zone (bioherm locality) NE of windmill on main ridge.

James R. (Robby) Moore, Tex. Co. Research Lab., Houston, Tex. ... mentioned many of the outcrops of yellow sand the place in the Uddenites ~~zone~~ (Linnor) part is equivalent in age to the Wolfcamp in the type area and eastward. Also that the Brachiopods and the graptolites may indicate different ages in comparison to other areas.

Robby gave me a couple of samples from near Shafter, Tex. he believed of Permian age. They contain orbiculoida and a lot of corals of scabrous of undoubted upper Permian, probably Gargasian.

My theory on the cyclic bedding in the upper Wolfcamp is as follows at the present time:

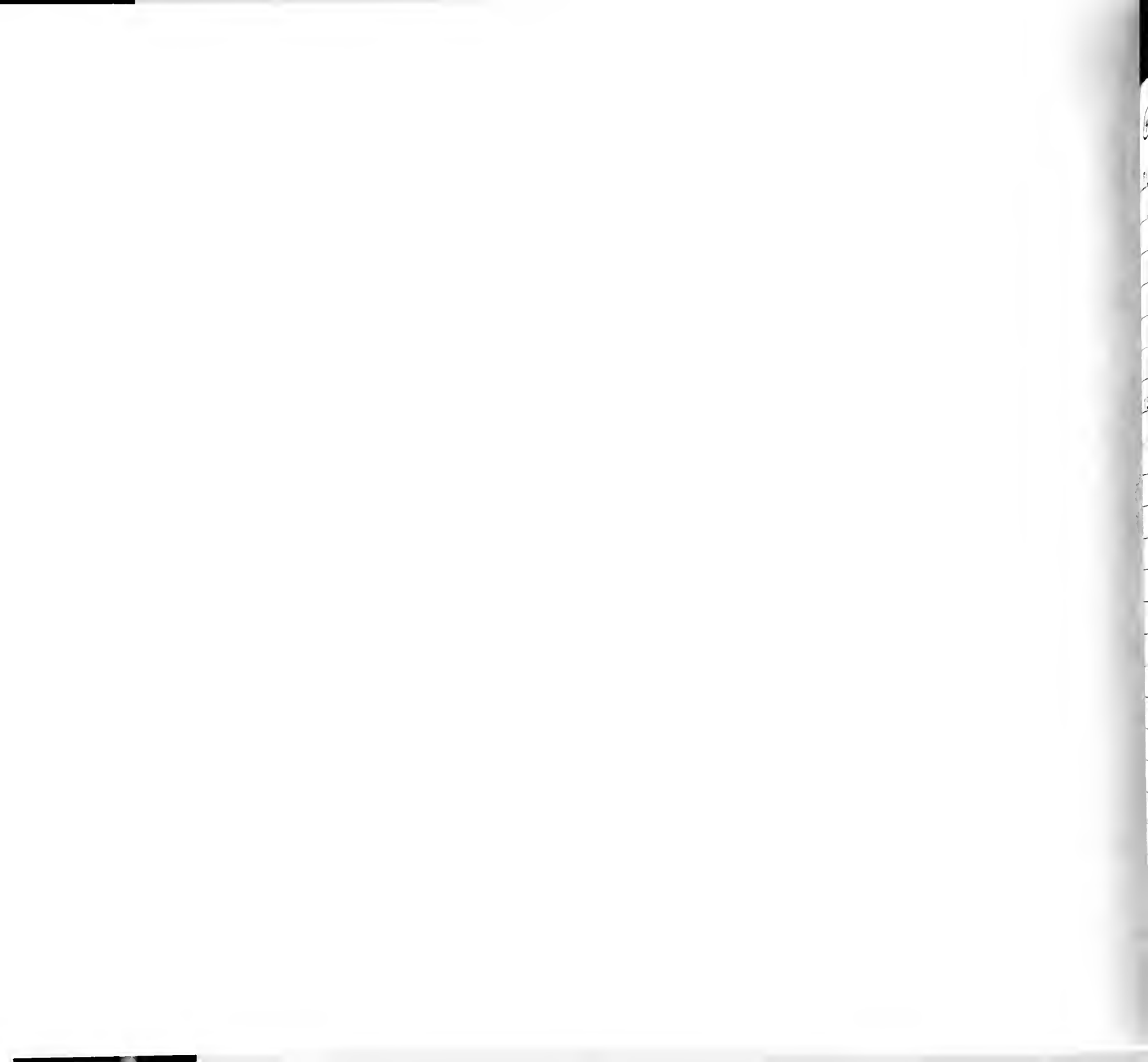
1) Downward of Wolfcamp basin to N. Deposits of gray sand shales and a few siltstones gradual filling edges of basin, but beyond "gray" facies.

2) Biohermal activity encroached on this more or less flat bottom "mud" flat from north to south in a northward direction. This accumulating until wave action takes over control.

3) The wave action sorts and drowns the later deposits of the biohermal deposits to near sea level, increases relative % of quartz and forms laminar bedding in upper such as var. By Pass was important and represents a considerable time of a lost record. Repeat back to condition 1.



There is more to this than just this simple diagram. The east west facies change leaves room for more questions than I have answers at this time.



(142)

7/28/57 - 1/28/57/1 - 1/28/57/1

Coll. 7/28/57/1 - 1/28/57/1 - 1/28/57/1

Ellen Rose open mal. zone; Orbitolites  
+ Trilobites.

7/30/57

Collection 7/30/57/1 - light gray shale beneath  
fresh water in a spring between Calamity  
+ S. 1. 2. 3. about 26 miles S. of Alpine.

Thinly bedded + dense (Cl. 7/30/57/1?) -

Thin section shows a sequence of fossiliferous  
trilobite - upper in. 1. 2. 3. Big Bend Shale BedCollection 7/30/57/2 - 1/5 part of fresh water  
sequence above.

8 (part)

Sect. 8

(143)

7/31/57

[see p. 7 + 135, +  
p. 96 + N.B. 2]

Section 20, (cont.) - dip 10° NW

11) Covered, 30', probably gray-brown shale for  
most part12) Calcarenite, <sup>greenish</sup> orange-brown weathering, poorly  
sorted at base, includes <sup>light colored</sup> dark chert; v. green  
quartz sand, Brachy, Crenoid + fusuline frag.  
The lower part is near a granular or fine pebble congl.  
upper 4" becomes well sorted.

Collection 7/31/57/1

Wood fragments common, bryozoans common. slightly under-  
represented (3 1/2')

13) Covered, 13', probably gray shale

14) Gray shale, with brown tinge: Collection  
7/31/57/2; 5'15) Calcarenite, like #12; but congl. pebbles  
larger, 4 1/2'; becomes better sorted  
(Coll. 7/31/57/3) and finer in upper 4"-5"  
flat top surface

16) Covered, 11', probably mostly gray shale

⑧

1. 1

2. 1

3. 1

4. 1

5. 1

6. 1

7. 1

8. 1

9. 1

10. 1

11. 1

12. 1

13. 1

14. 1

15. 1

16. 1

17. 1

18. 1

19. 1

20. 1

(144)

17) Calcareous, yellow-brown weathering, becomes well-sorted and with siliceous pebbles in upper 5", 1 1/2', Coll. 7/31/57/4 from #12 and loose stuff, probably from shale just above and just below #11.

18) Shale, gray to gray-brown, slightly silty  
12'

19) Calcareous, yellow-brown weathering; lower 8" are pebbly congl. a 1/2" shale breaks and the upper 4"-5" are well-sorted, evenly-laminated quartz sand & calcite sand, fine-grained flat top with an F. side zone of s.f. sand & silt.  
1"

20) Shale, brown gray, 3'8"  
near top Coll. 7/31/57/7  
near base Coll. 7/31/57/8

21) Covered, probably like #20, may have several calcareous (gray) ~~beds~~ beds. 26'

22) <sup>nod.</sup> LS, gray, with a large % (25-30%) Cobble congl. This might be best called a congl with ls cement locally. beds are 2 1/2' to 5' thick;  
18'; Coll. 7/31/57/5

(145)

23) Covered 5', less resistant zone of ls rubble? or fine sand?

24) LS, massive, locally congl (quartzite chert) med. gray weathering (see 6/24/57/2); upper 3"-4" bed is fine grained, flat topped.

25' Biohermal "Hess ls" of King  
Coll. 7/31/57/10

25) LS, rubble, some congl cobbles - lenses of 6" to 3' beds - contains biohermal junk, crinoids, bryozoans, large fusulines, brach. Coll. 7/31/57/6; 3'5'; This unit thins to about 8' to the SW just above the Kintajew dome - (about 200')

Section 20 continued about 200' to SW above Kintajew dome - followed at top of #24

25) Sandstone, light brown gray grading up into a congl of organic frag. hash. Has a well defined planar top with drum stains & cement. Tetradium common, also Productella shell frag.; 8'



7/31/57 &amp; 8/1/57

26.) Covered, 15', one 8" bed of siliceous pebble congl. exposed in middle of unit, rest is probably gray shale(?).

27.) A series of orange brown weathering, fine pebble congl., poorly sorted at base to well sorted at top, with flat upper surface - upper 2" are well cemented with SiO<sub>2</sub>.

Coll. 7/31/57/9 at base

Several beds of siliceous s.f. sandstone or siltstone  
10' ~~E~~

28.) Shale, <sup>(dark)</sup> gray brown - 3' Coll. 8/1/57/7

29.) Calcareous, orange-brown, organic frags; <sup>very</sup> fine pebble size; rounded stems, echinod. spines.  
6"

30.) Shale, mid gray brown. 2 1/2'

31.) like the beds in #27 - crinoids & graptolites  
6" - 1'

32.) Shale, dark gray 16'

33.) Calcareous (with high % of chert pebbles too) grading upwards through calcareous to quartz sandstone with iron oxide cement. weathering - light yellow to a deep orange-brown color.  
top 1" shale part - 1 1/2'

34.) Sandstone, weathers light tan to buff, grades into a siltstone and then into a shale. The fresher shale is dark gray.  
9'

35.) Covered 12', probably mostly dark gray shale

36.) Shale, dark gray & siltstone, weathers light yellow brown. These two lithologies grade both and forth horizontally as well as vertically 16' Coll. 8/1/57/6

37.) Calcareous; dark gray (faded); weathers to a mid. yellow brown. fully fossiliferous  
Collection 6/24/57/7 1 1/2'  
Surface silicification of fossils; also the upper surface is flat, well sorted, contains fine calcareous with siliceous zones.

38.) Siltstone, light yellow-brown, well laminated with lenses of calcareous, rather well sorted but not laminated.  
9 1/2'

39.) Covered, 18'

Coll. 8/1/57/5 from a poorly exposed bottom middle - like #30.





(148)

- 41) Calcareous, light gray yellow, darker gray green lines, alga masses and other fossils. irregular lenses of tan siltstone in various attitudes to bedding - 3' 8/1/57/4
- 42) Siltstone, finely laminated, yellow <sup>light</sup> brown weathering. Parting upward into dark gray shales; 29'
- 43) Calcareous; organic frag.; brachs, bryozans, crinoid stems; echinoid spines; fusulines. 1' 7/2/58/7
- 44) Shale and siltstone; some mudstone, weathers <sup>light</sup> yellow-brown; dark gray on fresh surface. 12'
- 45) Sandstone, light brown weathering, mud gray brown on fresh surface. Has fossil frags. in lower part, very silty in upper part. 1'
- 46) Shale and siltstone, light yellow-brown to mud gray weathering. In upper 2' ft., lenses of organic fragmentals appear. 27'

(149)

- 46) Ls, organic frag., mud gray weathering; tetracoral, large crinoid stems, brachs, bryozans. Bottoms irregular, seems to follow out or eroded top of #45. The top of #46 is smoothly undulatory, siliceous upper 2" 8" to 1' (shows siltstone congl toward down)
- 47) Sandstone, v.f. quartz, very silty; light gray brown weathering, no apparent beds. irregular blotches of varying shades of color. 0-1'
- 48) Siltstone, light gray brown weathering. Irregular top of #48, same location rests directly on #47. Sells. The trough so formed evenly and within 1 1/2' feet is evenly bedded. 14'
- 49) Calcareous, v.f. grained; weathers light bluish gray. Rich in brownish silt. Has a small coiled cephalopod nautilus, see bed 38, sect 17. 2' (a unit like #51 between the 2 ls beds of this unit)
- 50) Covered, 9', probably similar to #49. lt brown, sandstone very silty, poorly cemented.
- 51) Calcareous and chert-quartzite congl. with one or two siltstone beds. 8' light gray weathering except for chert & quartzite pebbles, some ls. corals and glau



(150)

SV 53) Ls, organic frag. & light gray weathering.  
 Productids, crinoid columns; upper 2"  
 rich in siliceous cement & fossils.  
 2 1/2'

53-54) ~~Continued~~ Alternation of limestones like  
 "23 a. d. limestones like "45, at least 4 alternations  
 interval is poorly exposed; siltstones have siliceous  
 bands. 12'

A 55) Calcareous, cobbles 3" to 6" diam; about  
 5% or less siliceous rocks in this unit.  
 8'

This seems to form the base of King's Basal  
 Leonard ls.

8/1/57/3, float found near bed 43. I believe  
 it has come down from either the top of  
 bed 50 or in the Leonard above.

8/1/57/10 - NE of Section 20, 200 yds, from bed  
 #24 - one light colored block, gray  
 ones are an matrix of rock

(151)

Afternoon (8/1/57) walked along Wolfcamp  
 interval to the NE about 1 mile. The upper  
 shale of the Wolfcamp is poorly exposed along  
 here and even the basal congl of the Wolfcamp  
 is incompletely exposed.

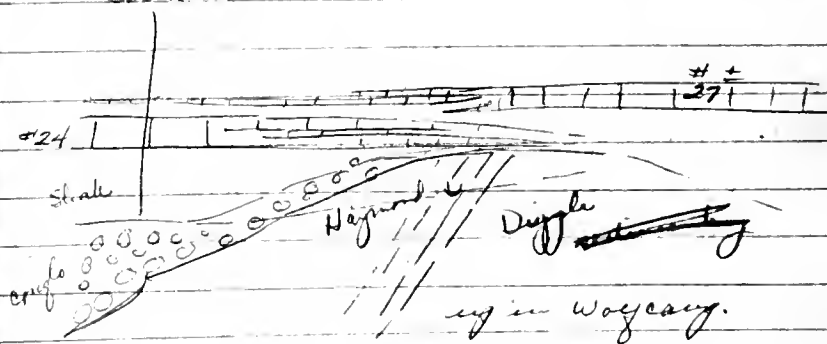
The Dimple is exposed in a window (?)  
 on the Dugout Ck Thrust sheet. ~~and~~ Dimple  
 is the apparent source for much of the  
 lower Wolfcamp Congl at this point.  
 Collection 8/1/57/8

Haymond? is exposed just to the SW of  
 the Dimple; (8/1/57/9) is from sand & siltst.  
 in Haymond.

SW

NE

Section 20



Handwritten notes on lined paper, likely bleed-through from the reverse side. The text is mostly illegible due to blurring and orientation.

Col. 8/1/57/11 - This rd is dipping slightly toward the town of Marathon, not a good exposure, but believe this is Gaptank thrust over Hayward onto Dimple.

The section on page 151 shows 2 units both thickening & thinning. There is really cannot be a fault - meaning the NE side about 60 to 70' with respect to the SW side. The thickening and thinning of the Hess limestone is sure does take place but perhaps not on the order of magnitude pictured on page 151.

The <sup>Hayward</sup> Canyon fault cuts the NE end of the Dean (Kemper) Hills. The lower Leonard ls is dropped on the NE side to a point below the Hess *Saccharinella* reef. The fault is composed of several thrusts or related fault blocks, in parallel to main fault system. Just S of Windmill, in line with the <sup>Hayward</sup> Canyon fault, there is another fault - the NE side has black chert (found in Dimple?) faulted against W of it. The Gaptank orange-brown sandstone.

The amount of cover NE of the place section 20 was measured & observes the geological relationship. I believe the Congl of the lower Wolfcamp is missing in part and pinches out completely over a couple of Hayward and Dimple (Wolfcampian) hills. The evidence is ~~rather~~ negative because what I believe is Gaptank sandstone (orange-brown) has no conglomerate cover. The Hayward clays & sandstones are exposed very close to the Hess *Saccharinella* reef and are ~~very~~ exposed typical of the lower Wolfcamp.

These faults according to P. King's map line up fairly well with the 3 that Clark the Head of Cathedral Mt. He maps the black chert as Ord. rather "V" units. The orange-brown beds are Gaptank. They look much like some of the ~~members of the lower~~ the *Cincinnati* group however. The purple cherts are present in great abundance in the conglomerate (see sample 8/1/57/1) which may represent the lower or basal portion of the Wolfcamp.



(154)

Lennet Hills near S. Ranch Road.  
 P. King has mapped the Hess as  
 being faulted about 50 to 75' down to  
 NE direction and I believe there are  
 several smaller faults parallel to the  
 main one. I will see you in the  
 section below the Hess ~~is~~ not, but  
 I believe the Lennet is faulted below  
 the Hess at the foot and the Lennet  
 chert seems to cap it. G. A. Cooper  
 in the West Texas Perm. Guide Book  
 1921 <sup>means</sup> ~~means~~ that it seems to be Lennet.

9

(155)

8/2/57

## Sect. 9

Section 21 - Sullivan Ranch Road at NE  
 end of Lennet Hills. P. King called this  
 interval Wolfcamp, I believe it is probably Hess.  
 0° dip for measurement.

1) Ls, mud gray, more or less massive, forms  
 lowest party slope - 8/2/57/1

The lower 5' of this unit contains chert  
 pebbles (fine) in well defined bedding band.  
 Dark + Ord. cherts. Upper 1' is orange-brown  
 well sorted; total 34'

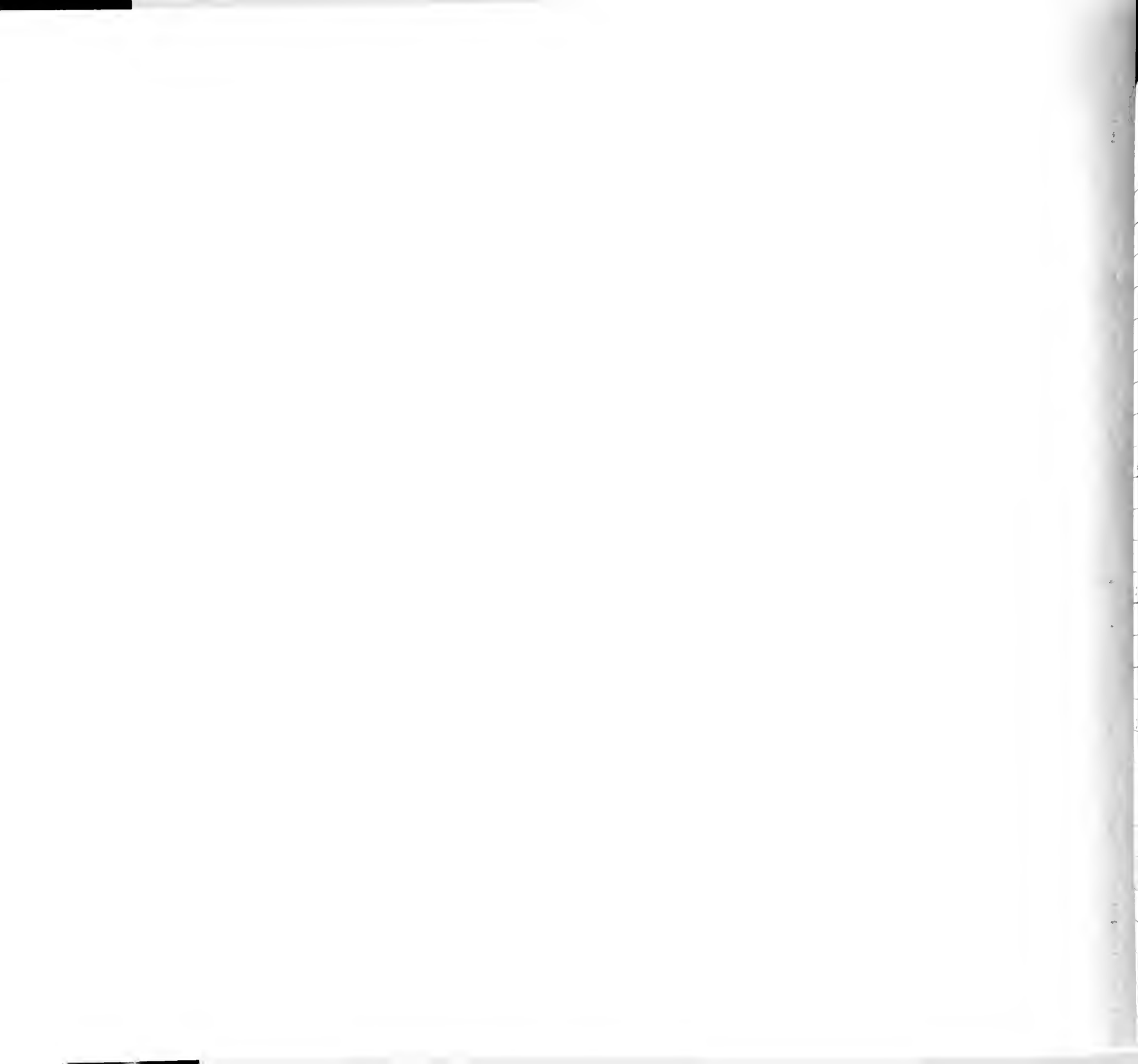
2) Covered, 34'; patches of light brown siltstone  
 and sandstone crop out here & there in this  
 interval but no definite relationships  
 were determined. In the upper 15'  
 several biohermal rubble ls appear to  
 be present.

3) Medium to dark gray calcarenite; well sorted,  
 upper 1/2" is dark siliceous rich. 1'

4) Shale + siltstone, light brown 1'

5) Ls, gray with a tinge of brown. Biohermal  
 rubble - Crinoid columns 2" or more diam.  
 3" to 2' beds - total 5 1/2'





- 6) Covered, 7' probably mostly light brown  
shales & siltstones.
- 7) Calcareous, green gray to orange brown, a  
few small pebbles near base, grades into  
fine sand near top. Upper 1"-2" siliceous  
ferric rich. 2'
- 8) Covered, 25', this seems to be light brown  
shale for most part, some siltstones  
and some very fine sandstones.
- 9) LS, organic frag.; some black chert (Ord.?)  
Crinoid columns, bryozoans, and graptolites. 14 1/2'  
8/2/57/2
- 10) Shale, siltstone, + v.f. sandstone; light  
brown weathering. 17'
- 11) Covered, 27'
- 12) Massive LS, light gray to light tan weathering.  
Lower 6'-10' have large ls cobbles, small  
amount of fine chert pebbles. Coll 8/2/57/3  
58' This unit has been dolomitized  
top of NE mantle knoll.

## Section 22 - NE of Sullivan Ranch Rd.

Starts between 2 windmills.

[no thesis sec. #] [see p. 129 Nb. 2]

Graptolite below is badly folded & faulted,  
chert congl. breccia in the greenish chert, beds  
of chert below seem ~~to~~ well bedded & not  
excessively broken - graptolite is present as  
well as brown sandstones.

- 1) Conglo, much chert <sup>pebbles</sup> and limestone cobbles.  
Breccia cement matrix. dip is about 15° <sup>N</sup>  
20' become fine upwards, some organic  
fragmental material comes in. 2-3' beds.  
8/2/57/4

a) LS, med gray, mostly organic frags, some  
small chert pebbles. Crinoid stems dominant  
has brownish line (weathered). Coll 8/2/57/5  
about 20' up from base.

Coll. 8/2/57/6 about 60' up from base -  
thickness - 78' + The upper beds dip S  
about 45 to 60°, I suspect this unit is  
faulted Leonard, a thin bit of upper Hess  
is #1 and no lower Hess or Wolfcamp  
at all. Leonard or Upper Hess resting on  
Dingley, Haymond Series and Calboone.



the along creek - outcrop as far as the  
 Deser pier line then seems to be no  
 exposure of rocks older than these  
 in section 22. The green-brown  
 sandstones (Barren?) as in a  
 very light incline or overturned a decline  
 which strikes near E-W parallel with  
 the fault to Leonard. I believe  
 the dissected rocks are faulted down  
 because I can trace this structure  
 about a quarter of a mile.

The ~~Barren~~ Colorado Breccia zone  
 is quite thick here (40 to 50') and  
 has an even surface which  
 appears like cut. It dips  
 steeply to the N. ~~about~~ as much  
 as 50°. This surface has since  
 been dissected and is now cut by  
 many 2ndary faults. The complete  
 geologic relationships of these beds are  
 unfortunately ~~being~~ concealed.

Coll. 8/2/57/7 - Blue shale 20' interval below  
 Hexo ls ledge, N45°W of Deser well  
 now windmill.

Coll. 8/2/57/8 - Biohermal or Biostrumal  
 zone in base of Wolfcamp Congl. (G.A. Cooper  
 locality) almost due west of Deser well  
 windmill.

It would be nice to check the outcrop on  
 the Donald H. Ranch that P. King mapped  
 as Wolfcamp. The Leonard Mt. section  
 will have to suffice.

Why should P. King have missed this  
 important structure by the Sullivan  
 Ranch Road? Probably didn't walk over it. (?)

8/3/57 Shipped 138<sup>th</sup> of rock specimens  
 in 3 sacks, the heavier two were  
 double-gunny sacks.

End of Book one 1957



Typed from original by C. Ross  
in 2002 ±

doc. 315

C.A. Ross  
Peabody Museum  
Yale University  
New Haven, Conn.

FIELD NOTES  
BOOK 1

Marathon, Texas, Summer 1957

Study of  
Wolfcamp Hills and Wolfcamp sediments  
along south front of Glass Mts. -

C.O. Dunbar visited me on the field on the  
22,23,24 and 25th of June, 1957.

June & July, 1957

PG. 1

6-22-57

(Neal) Taylor Ranch-Wolfcamp Hills-Sunny-Warm.

Collection-6-22-57-1- Upper of P. King bed 2- point over Geologist Canyon- 200  
yards north of Uddenites Saddle.

{note: illustration: P. King's Bed 2:

layer 1: 20'

layer 2: 4'

layer 3: 6'

layer 4: 4'}

Collection 6-22-57-2- From about middle of P. King bed 4- 100 yards east of turn  
of Creek Geol. Canyon.

PG. 2

Hess is a limestone sequence and under lies the Leonard which is siliceous-The  
Leonard just beneath the sill and top of Wolfcamp is calcarenites, and often very  
silty- well bed. The Hess Conglo. is "white".

The western end of the Wolfcamp looks like a good place to measure the Hess  
Conglo. and to determine fusulinid sequence in the Lower Hess (or Leonard) -  
Check this section against the conglo. sequence on the north fork of Geol.  
Canyon. Question to think about: What is the nature of the cyclic deposition of  
the Wolfcamp sequence? The limestones start off with rumble and then go up  
through clastics which become finer and finally are present as finely laminated  
sand (calcareous). These laminae are similar to the individual sets of beach  
deposits in Lyons Ss. What cause cycles? What conditions changed to cause  
deposition of Hess Conglo. and Leonard silt and clastic beds?



C.O. Dunbar and I drove around east end of [Wolfcamp] Hills and got back side-road not so good. Walked the eastern exposure of the upper Wolfcamp (P. King beds 4 to Hess Conglo.).

PG. 3

The fauna needs to be studied from various points along the same bed for the length of exposure. Reef nodes form in great abundance on P. King's bed 9 to 12- this cause uneven, distorted, limestone ledges just above-result of differential compaction.

PG. 4

6-23-57

Cool in morning, sunny, some haze-dusty and hot in afternoon. Regional showers in late afternoon.

Went to Hess Ranch and to spur of ridge around which road winds- C.O. Dunbar explained section to top of ridge roughly as follows.

{note: illustration: "Hess Conglo.":

bed 1: 75' or more, chert and limestone pebbles congl.

bed 2: 60' +/-, 6-23-57-1, fossiliferous limestone (Wolfcamp)

bed 3: 100' +/- dolo.}

The age of the dolo is questionable - The "Hess" Conglo. has Wolfcamp fusulines overlying it- so that the congl. is apparently one of the Wolfcamp series.

The possible correlation of the above section with that of Leonard Mt. needs to be definitely worked out.

6-23-57-1- Spur above Hess Ranch Home- just east of fault, about 15-20 feet below base "big dolo" ledge (about 10' below "rusty" layer).

PG. 5

{note: illustration: "Leonard Mts. Section":

bed 1: Slump? Fault?

bed 2: Gaptank? Uddenites shale - G.A.C. has \_?\_. (This probably from

Talus slopes- not much strat. value)

bed 3: Wolfcamp. Conglo, \_?\_

bed 4: Limestone beds

bed 5: dolo

bed 6: This is loaded with Fusulines.

bed 7: Leonard?

What happens in the lower part is really a question, beds are mixed up, short horizontal exposures and great variances of dips.

"Wolfcamp" of King - Tenus}

Uddenites Shale- east side of Geologist's Canyon 6-23-57-2.

6-23-57-3- West flank of western main reef noted in P. King's limestone 2 due north of Neal Ranch.

{note: illustration:

North side = 20'; Well bedded, limestone, which thin between reef heads to about 20'.





6-23-57-3; cobbles of limestone and organic fragment debris - Bryozoans, Dictyoclustus [brachiopods], Crinoid plates.  
South side = 80'; Massive reef head in P.K. bed 2.}

#### PG. 6

Uddenites zone- Brown weathering material in limestone- what is it? Section along face of Mid Hills {note: illustration: Uddenites member: Upper Gaptank limestone of King. #2 limestone in between west and east section.}

Note the great changes in thickness of the Uddenites shale- The contorted bedding of the upper Gaptank limestone, the biohermal nodes and variation in thickness of other beds- Trace these out and try to find out if the Uddenites member is along a facies, a time units, which may have been deposited as the Gaptank was being deformed, time of deformation- what is structure of this? joints? what about joints? about the draped limestone over the higher biohermal developments?

#### PG. 7

6-24-57 Sect. 8 (part)

1st limestone ledge about 20' above top of Wolfcamp Conglo. in Section Carcajew nest in Lenox Hill- ref. C.O.D. 6527/34 collection 6-24-57-1 is in same horizon as his- see also 8-12.

6-24-57-2- From same section as -1; This is from a large block of limestone. 3'x2' in the Hess ledge- The ledge itself is a Sacchinella- Leptodotus reef with medium boulders of various rock types in it. This block from which this sample is taken is apparently on edge in the rubble of this reef. {note: illustration:

bed 1: 6-24-57-3 (8-24); crumbly limestone (with some clay) with pebbles.

bed 2: 5'; dense well bedded limestone.

bed 3: 5'; gray.

bed 4: 8'; vuggy limestone (Carcajew nests).

bed 5: 15'; massive reef breccia.

bed 6: 5'; bedded limestone.}

The exact base of the Hess is questionable here- any of these lower 3 contacts would be acceptable.

#### PG. 8

{note: illustration:

layer 1: 6/24/57-3 (8-24); (1) a gray limestone with fine to medium pebbles and abundant crinoid stems and shell fragments.

bed 2:

bed 3: dark gray, thin bed shale, 1' shale, is like (1)

bed 4: 8' thick (like (1))

bed 5: dark gray, thin bed shale 0'-3'.

bed 6: 6/24/57-4 (8-24); limestone lense.}



The fusulines in -4 are possibly weathered out from lower horizon and redeposited in pockets in the reef facies. C.O.D. believes these are at least superficially similar to those of collection - 3.

The contact between the massive cliff forming and the underlying could be either a cut surface or a squeezed surface. The way the lower limestone units in the siltstone lens in and out would suggest a facies change and not a great unconformity right at the base of the Hess ledge.

#### PG. 9

Collection 6/24/57-5 - at the base of Upper Hess Ledge, 250 yards south of gully 1st head lg. which follows down Carcajew section. Unit 53, Section 8.

Collection 6/24/57-6 - a fossiliferous (8-37) horizon in Hess which is 1/2 way more or less (80') above the basal Hess Sacchinella limestone. This interbedded with the siltstone, sandstone (CaCO<sub>3</sub>) iron - chert stained.

Collection 6/24/57-7 - slabs of a fusuline and shell cochina-45' +/- above top of Lower Hess Sacchinella limestone reef at Carcajew section.

#### PG. 10

Gaptank type area. Clear and sunny.

loc 1 6/25/57-1 Collection from a limestone within the upper Gaptank conglo. of P.King on or close by to the type section.

loc 1 6/25/57-2 Collection on back northeast slope at top of P.King Upper Gaptank conglo. unit.

loc 2 6/25/57-3 10' above Collection 2 - 6' or 8' of brownish weathering nodular limestone with interbedded yellowish shale-beds above are sandy (brownish-red).

loc 3 6/25/57-4 about 80' above Collection 3 in what we believe is P.King's (this maybe his #2 limestone however). This is #2! light gray to white limestone with occasional light yellow patches.

loc 4 6/25/57-5 near top of P.King's #3 limestone- In one of many gray limestone shell cochinas. This slope has some loose fragments on it which are included in collections.

loc 6 6/25/57-6 10' to 15' below base of P.King's #4 Gaptank limestone - in a brown and gray weathering limestone.

#### PG. 11

loc 7 6/25/57-7 Collection taken at base of what we believed is P.King's #5 Gaptank limestone.

Drove C.O. Dunbar to Monahans to get Santa Fe for Dallas.

C.O.D. seemed pretty convinced that the Gaptank is Canyon in age and not Cisco. Suggested that Uddenites might be a Cisco equivalent and he said yes that was what the fusulines pointed to. He didn't know whether the #2 limestone of King's might not also be Cisco also- The problem of the conglomerate pebbles in limestones came up again. This is a good point-Ref. to Australian paper might be good here.



C.O.D. wants more collection from the upper Gaptank in type locality. Also a close study of the Wolfcamp and Uddenites zone in that region.

PG. 12

6/26/57-1

Wolfcamp Hills- east end.

Studied the "Dolomite" sequence at east end of the hills- The eastern most ridge is composed of limestone, the dolomite if present is limited to one or two narrow bands. The limestone is a more or less typical biohermal deposits, very large amounts of crinoidal debris and brachiopod shells, a few echinoid spines.

Fusulines are few and are rather rare over in what appears to be pockets.

Collection 6/26/57-1 is from a smooth weathering limestone band about 8" thick within the upper 2' off the massive face forming limestone, This is overlain by about 2' of unevenly bedded limestone and dolomite. The dip of the massive limestone and the unevenly bedded layers is S70E.

Much of the slope to the SE of this narrow ridge appears to be rotated and slumped. The Uddenites beds are exposed.

Collection 6/26/57/2 and 3 {note: illustration:

bed 1:

bed 2: 15'

bed 3: 7'

bed 4: 4'; Collection 6/26/57/2

bed 5: 9'; 6/26/57/3}

PG. 13

This collection (2) is from the 2nd limestone highland from the eastern end of the Hills. The pocket from which these fusulines came is rather thin but of considerable horizontal extent.

The stratigraphic interval between 1 and 2 appears to be only about 12' above collection 6/26/57-1, but the relationships are obscured by discontinuous bedding and rubble of these 2 biohermal masses.

6/26/57/3- From the highest portion of the 2nd bioherm on the east end of the Wolfcamp Hills. This collection is about 12' to 15' stratigraphically higher than (2).

6/26/57-4 west side of 2nd biohermal reef. {note: illustration followed}

PG. 14

6/26/57/5 - Collection is from uppermost limestone ledge in what will be tentatively called the Uddenites Member, just west of the 2nd biohermal high.

{note: illustration:

6/26/57/5 - Brown-red even surface; Brown shale.}

6/26/57/6 - This is collection from a fusuline horizon in brown-yellow weathering band at the base of the apparent upper Uddenites limestone bioherm (near the middle of the eastern sector in a wind gap.)

6/26/57/7 - Collection from Uddenites zone, 200 yards south of western end of disembarkment at east end of Wolfcamp Hills. The #2 limestone bioherm of King



has beds dipping near east at this point and many blocks of this limestone have slipped down to cover the contact. This Uddenites bed is high in the zone and is a gray nodular limestone with interbedded brown and rust weathering siltstone. The calcite in the original rock has been recrystallized, probably as a result of the post-deposition

#### PG. 15

texture at this end of the hills, lowering the eastern end.

6/26/57/8 - Collection from brown weathering brachiopod and fusuline coquina limestone, about 25 feet stratigraphically below 6/26/57/7. {note: illustration:

bed 1: 3'; 6/26/57/8

bed 2: 15'; gray shale

bed 3: 1'; Brown ironstone

bed 4: 10'; Shale? gray

bed 5: 2.5'; 6/26/57/7}

The east of the Hills are going to present problems in covered intervals and erratic discontinuous deposition.

#### PG. 16

6/27/57 This was one hell of a hot day.\

##### Section 25

Wolfcamp hills - Measured Section-1 Sec 25

S15E° to water windmill at Neal (Taylor) Ranch

S85E° to water windmill at tank east of Ranch

##### Gaptank

1) Covered below

2) (uneven 6-8" beds). Limestone, weathers gray to yellow-brown, a shell hash of brachiopod and fusuline frags; 5.5'; Collection 6/27/57/1 (dip 16°)

3) Covered, probably shale which weathers gray brown, 37'

4) Limestone, gray to yellow weathering, lower portion (2') 3-4" nodular beds, upper portion in uneven beds 2-4' thick. Thin bands of interbedded brown shale - 17', organic fragment. Collection 6/27/57/2, Top Gaptank.

5) Covered - 57' probably gray shale with a few rusty yellowed? sand-siltstone layers, no definite bedding could be distorted.

6) Limestone, rusty weathering, Crinoidal fragments are dominant, some pockets of fusulines are present - 8'. The upper portion of this layer has black limestone pebbles in it, but have no fossils.

Collection 6/27/57/3 - one block which contained a good fusuline fauna may be from higher in the section.

#### PG. 17

7) Covered - probably shale 52'

8) Limestone gray, weathers light brown, lower 11' are rubbly becoming better bedded into undulating 3-4" layers: Upper 13' massive in 3-4' beds, biohermal limestone. The shell fragments are dominantly brachiopod and crinoids, total 24', Collection 6/27/57/4.





- 9) Covered, 5', probably a weak limestone.
- 10) Limestone brown weathering, slightly sandy 7', Collection 6/27/57/5.
- 11) Limestone gray to brown weathering 5-60'. (note: illustration:  
     bed 1: 6/27/57/4  
     bed 2: 5'; 6/27/57/5  
     bed 3: 6/26/57/5  
     total height 60'}

The upper surface of #11 unit has a 1/2" limonite stain on a relatively recent exposed surface.

{note: illustration:

Reef 1: Reef 2 what I believe is probably equivalent to P. King Bed 2.}

#### PG. 18

The formation of Reef 1 precedes that of Reef 2 and the debris from Reef 1 sloped toward the southeast. The relations are not completely clear but the debris from Reef 2 appear to rest on the truncated edges of Reef 1 debris, suggesting that Reef 1 had a greater extent to the northeast but was removed before Reef 2 came into existence.

Top of Uddenites

- 12) Covered 27' probably soft limestone
- 13) Limestone gray weathering, a biohermal hash. #2 limestone? 17', in 4-5' massive beds
- 14) Limestone nodular, dark gray, weathers to white. 5-25'.
- 15) Calcarenite, yellow weathering- Caps 14 but intertongues with it {note: illustration:  
     bed 1: 13  
     bed 2: 14  
     bed 3: 15; 7'  
     SE}

16) Limestone yellow-buff weathering - 20 feet, collection 6/26/57/4 is from this interval-- Top of Ridge -

#### PG. 19

##### Section 24

Section II about 200 yards southwest of section I.

- 1) Shale, dark brown, bottom of interval not seen, top not seen, estimate 100-125' thick.

Collection 6/27/57/6. [Gaptank shale is considerably thicker here than at type section?]

- 2) Limestone, dark gray, limestone rubble at base 8', massive limestone ledge 3' (Collection - 6/27/57/7) at 33' above base of 1st ledge - Collection 6/27/57/8 (24-2B), this unit became progressively more shaly in the upper part. Total thickness of this unit is 74'.

- 3) Limestone, gray; brownish-yellow weathering-indistinct nodular bedding in lower 8' of this unit. Collection 6/27/57/9 at base- 33' massive limestone with one



2' band of nodular limestone about midway in unit. Total thickness 41'. The upper part weathers gray on top.

- Top of Gaptank - Base of Uddenites

4) Covered 12', probably brown shale.

5) Limestone, light gray with interbedded brown siltstone - Crinoidal, dark. 5' occasional brach. fragments.

#### PG. 20

6) Covered - 9', probably gray shale and a few brown siltstone bands

7) Limestone, brown weathering, bedding 6", uneven surfaces, Crinoid, brachiopods and a few fusulines. Collection 6/27/57/10 (24-7) 8'.

8) Covered - 12' probably lime nodulars in a clay or silt, some brown colors.

9) Limestone gray, massive

a) fusuline and brach coquina in a 6" band at base, Collection 6/27/57/11 (same horizons as 6/26/57/6).

b) Massive limestone ledges 4-6' thick.

These form the dip slope and seem to be about 10' below what I believe is P.King's limestone #2 bed. 12' thick (?)

#### PG. 21

In the afternoon of 6/27/56, I drove northeast from the Wolfcamp hills to a tank (about 1.5 miles). From there I walked slight west of north to the low outliers of the Wolfcamp and Hess as mapped by P.King. I found silt and sandstones with even bedding exposed in a gully. They would suggest that the conglom. Hess at Wolfcamp Hills is only a local bed or lense. The sandstones are medium lamellae- 1/8" to 1/16" and have abundant tube (or fecal castings) of worms - one I measured was 5" long, 1/4' in diameter and near straight.

- About 2' above this silt and sandstone sequence in the rubbly part of the limestone. I made Collection 6/27/57/12. It looks like what C.O.D. said Schubertellia Kingi would look.

- 4' above collection 6/27/57/12, I found a brown shale- it had a few streaks of red-brown at the top and some gray in patches- Collect 6/27/57/13 from shale.

#### PG. 22

At this time I'm not too sure of the data, but the deal about shifting and eroding reefs maybe a partial answer to the big picture. Perhaps in well logs we could get the needed 3D perspective on the facies shifts. After briefly looking at the lower Hess, I wonder at what silt, sandstones and cemented siltstones, with a few interbedded limestones might mean with relation to the cyclic Wolfcamp and the irregular and peculiar Uddenities zone. The phases of the biohermal growth in the Wolfcamp must have had other types of deposits elsewhere - could they not be represented in either the Uddenities facies (no because of fossils?) or the lower Hess (which is not well known faunally).

The Hess section I saw in the afternoon needs to be restudied in greater detail. The massive cliff former in the hill is probably all Hess, but King reports some Wolfcamp and so the face of the hill needs to be studied.



PG. 23

6/28/57

Section 23

Near Center of WCHs

Section III in a line N30W of Taylor (Neal) Ranch

1) Upper Gaptank limestone - same unit as 3 in section II. Here it is less massive, about 8', with the middle nodular zone of unit 3 in Section II thickening up to at least 10', about 12' more is covered and it looks as if the lower massive zone of unit 3 section II is either missing or is nodular here. The upper 2-3' is a nodular limestone in 6-8" layers - becomes sandy. {note: illustration:

bed 3: 13'

bed 5: covered-12'

bed 6: 10'

bed 7: 8' to about 5'

bed 8: 3'; Collection 6/28/57/1 (23-1)

Top of Gaptank

bed 9: covered}

PG. 24

2) 34' covered - probably a gray shale -

3) Limestone, brown weathering, gray on fresh surface- This is an organic fragmental rock of brachiopod and a few coral frags. The lower bedding surface of this unit contained pockets of fusulines. Collection 6/28/57/2; 3'.

4) Covered internal - 23'.

5) Limestone yellow brown weathering, in beds 4-8", Crinoidal and fusuline coquina here, 50' to the west of the unit becomes massive and composed only of crinoidal fragments. Collection 6/28/57/3 is from base of this unit. Collection 6/28/57/4 taken 20' above base of this unit. The upper part of this unit became massive and is probably a bioherm. It tails off in both east and west directions into thin beds at the top of the western bioherm and thin beds at the base of the eastern bioherm, 33'.

6) Covered - 8' probably gray shale- Heightens to 12" but this depends whether it is between bioherms or at the top of one.

PG. 25

7) Limestone, gray weathering, I take this to be the base of P.King's #2 limestone. This is a fine grained calcarenite at this point. The 2 feet of rubbly material below the base of the unit has a fusuline fauna (Collection 6/28/57/5) 4' thickness of unit. {note: illustration:

bed 1: 6/23/57/1

bed 2: covered-34'

bed 3: 3'; 6/28/57/2

bed 4: covered-23'; 6/28/57/3 (23-5A)

bed 5: 33'; 6/28/57/4 (23-5B)



bed 6: covered-8'

bed 7: 6'; 6/28/57/5 (23-7)}

PG. 26

Collection 6/28/57/6 from a brown weathering biohermal limestone in the Uddenities zone. This is approximately midway between the base of P.King's #2 limestone and the top of the Gaptank limestone- The Uddenites zone is badly covered here- This section is in line with the road down to the Ranch House S55°E, I estimate the thickness to be 85-95'- The outcrop from which collection 6/28/57/6 is about 8'.

Afternoon- West of Main Hill {note: illustration followed}

PG. 27

The outward appearance of this is quite misleading. The Gaptank limestone forms an anticlinal structure under the western bioherm of the main #2 ledge- The Uddenites zone and a part of the biohermal reef have slipped as a unit down one of the lower Uddenites shale bedding planes. The mass now rests in a structural valley of the Gaptank fm. The eastern side has moved the furthest with about 175' of displacement, the western end is more or less hinged about a point.

Collection 6/28/57/7- about 6' below top of Gaptank fm - east side of Geologists Canyon- On the east side of Geologists Canyon, the "window" which C.O.D. pointed out on the first day is most confusing. I have some doubts as to whether it really is a "window" structure. The Gaptank does some fancy folding at this locality and it seems that the Uddenities zone is missing and the #2 limestone of King sits directly on Gaptank limestone.

PG. 28

The Uddenites zones if present is only a foot or so thick, but probably is represented by little more than an erosional bedding plane. The fossils present are dominantly crinoids and a few brachiopods and are now a red chert or silica. This area is quite important and it will pay to study the fauna as carefully as possible to determine age relationships. The dips and questionable faults also may have some importance on the regional structure of the late Penn.

6/29/57 - Drove to Alpine and got a haircut and the brakes tightened on the car. Did some banking for Mr. Fallis also. Sent off 2 bags of rock specimens to Peabody Museum on this date also. Railway Express-COD-100lbs. total.

PG. 29

6/30/57

Section 22

Geologists Canyon-Section IV





Collection 6/30/57/1- P.King's gray limestone (#2 bed) in creek floor. Covered below.

1) Limestone, gray weathering 6"-3' beds, most crinoidal fragments and some other organic fragmental matter. 31'. The upper portions of this unit have progressively large limestone boulders in them, most of the upper 6-7' is composed of limestone cobbles 3" in diameter in a limestone matrix. The upper most foot loses the large limestone cobbles - The few pebbles found on the upper bedding surface are about 1" in diameter. (6/30/57/1 is from the lower 3' of this unit). Collection 6/30/57/2 is from upper 3' of this unit.

2) 8' covered-probably gray shale. Collection 7/1/57/10.

3) Limestone, conglomerate. 1/2" to 2" diameter pebbles, well rounded, little if any chert pebbles - some crinoid stems, a productidae - brown-yellow weathering. Collection 6/30/57/3. 4'.

PG. 30

4) Covered 7' black to bluish shale in lower part.

5) Limestone, conglomerate yellow-brown weathering, upper 1' is sandy and organic fragmental. Flat bedding plane on top. Bryozoans, fusulines, crinoids common on upper surface. Collection 6/30/57/4, 3.5 feet.

6) Covered, 44' one or two 4-6" brown weathering sandstones are probably interbedded in a shale (gray?).

7) Limestone, conglomerate and rubble at base grading upward into organic fragmental and finally a sand layer (well laminated) in the upper most 3-4".

There is apparently a shale parting between the rubble-conglomerate portion and the organic fragmental-sand portion.

Typical flat top bedding plane. (6 feet +- ?).

PG. 31

{note: illustration:

bed ? : covered

bed 7: Collection 6/30/57/5 and 6/30/57/6 (shale parting)

bed 8: 6/30/57/7

bed 9: 6/30/57/8 and 6/30/57/9 and 7/1/57/9}

8) 2' - of which the lower 1'8" is a rubble of crinoid parts - upper 3" fine grained, laminated sandstone ( $\text{CaCO}_3$  + much silicification) - a 1" shale parting separates this litho.

9) a.) shale grey-grading into crinoid coquina and 1" diameter pebble which forms a rubble 2.5'.

b.) Repetitions of 9a 1.5' followed by shale parting 1".

c.) Fine coquina grading upward into a coarse ss, laminated with flat upper surface 2'.

PG. 32

10) Covered 30' - brown to gray shales probably

11) Limestone, orange-brown weathering - another cycle like unit 5 or 7. 4', Collection 6/30/57/10 in top portion of unit 11.



- 12) Covered 13'
- b) then a 4" brown ss; fine crinoid sizes in ss.
  - c) 10' covered
- 13) Orange-brown calcarenite - fine grained planar upper surface - no rubbly  
2nd layer observed {note: illustration:  
 bed 1: 4"-6", lamillar shelly zone  
 bed 2: 2"-3", reworked shell zone  
 bed 3: 3", fine ss lamillar  
 Top of (13); 6/30/57/12}
- 14) Covered 7'.
- 15) Limestone, brown-yellow weathering irregular bedding, but with 1" top zone of fine ss nearly planar. 6".

#### PG. 33

{note: illustration:

- bed 10: 4" ss (Cal.; 7/1/57/8
- bed 11: 6/30/57/10
- bed 12: 7/1/57/11 and 6/30/57/11
- bed 13: 6/30/57/12

- bed 13:
- bed 14: 7'
- bed 15: 3'; 6/30/57/13
- bed 16: (16a), 5"  
 (16b), 1'  
 (16c), 2'; 7/1/57/7  
 (16d), 1.5'; 6/30/57/14}

#### PG. 34

- 16) a) 3' gray shale  
 b) 5" brown calcarenite bed  
 c) 1' gray shale  
 d) 2" brown calcarenite bed  
 e) 2' gray shale  
 f) 1.5' calcarenite sandstone

This is a typical top sand and rubble limestone

- 17) Covered - 25' gray shale?
- 18) Limestone, the typical planar top surface and shell coquina below - 2' total.  
Collection 6/30/57/15.
- 19) Cover 7' Shale?
- 20) Limestone with some chert pebbles - brown weathering and not so yellowish as most: A conglomerate (pebble) at base of this is Collection 6/30/57/16 (6")  
The finer grained, sand (calcarenite) is Collection 6/30/57/14 (4")

#### PG. 35

{note: illustration:



bed 16:  
bed 17: 6" to 1'; 7/1/57/6  
bed 18: 6/30/57/15  
bed 19: 7/1/57/5  
bed 20: 6/30/57/16  
bed 21: 6/30/57/17 and 7/1/57/4 and 7/1/57/2  
bed 22: 6/30/57/18  
bed 23:  
bed 24: 6/30/57/19}

PG. 36

- 25) a) Covered 16'  
b) brown ss much like 12b, with small crinoidal debris  
c) shale 12', with one 3" brown ss band like 20.  
26) Limestone brown weathering, shale beneath- 1.5', sample 6/30/57/20  
27) Shale, covered in part, 3'  
28) Limestone orange-brown, few fossils 1.5'  
29) Shale, yellow to orange with a few siltstone layers - 22'. Collection  
6/30/57/21 (a+b)  
2 sacks. Brown weathering limestone-sand near base.  
30) Covered 11' probably more of 29 shale, +- 266'.  
31) Hess Conglomerate.  
continued, bk2p

PG. 37

{note: illustration:

bed 24:  
bed 25: a) 7/1/57/3  
b)  
c) 7/1/57/2  
bed 26: 6/30/57/20  
bed 27:  
bed 28:  
bed 29: 7/1/57/1  
a)+b) 6/30/57/21}

PG. 38

7/1/57

Took shale sample from Section IV

7/1/57/1 to 7/1/57/11 as marked on Section IV

7/1/57/12 in lower 20' of Basal Hess Conglomerate in creek bed of Geol Canyon.

These are cobbles and boulders for use in determining source.

7/1/57/13 Sample of conglomerate Hess, upper 10'.

The Hess Conglomerate is about 35' to 40' thick here.

PG. 39

7/2/57



Mr. Jarvis and his assistant Joe? went into field with me. Looked over lower section on West flank of WCHs. Mr. Jarvis spotted a fault? in west end of WCHs better check it because it looks as if #4 in drop to Uddenites Saddle. {note: illustration:

- bed 1: covered
- bed 2: 7/2/57/2; 27'
- bed 3: 3'; 7/2/57/1
- bed 4: 11'; Uddenites zone
- bed 5: 5'; King's gray #2 limestone
- bed 6: 1.5'
- bed 7: 2'
- bed 8: 1.5'}

PG. 40

CR's Section 20 (GSA M.88)

Section V West end of the WCHs proper - measured N20W from outlier [about 300 yards west of King's Sec 24].

Below covered by out wash - Uddenites zone probably.

- 1) Limestone conglomerate, with crinoid and brach frags., conglomerate cobbles 1' to 4" diameter. 16', gray outcrop - top surface is near flat, has an inch zone weathered brown. Many of the crinoid stems are relatively unbroken and probably have not had a great deal of erosional transport.
- 2) Covered, 25' - seems to be an interval of gray shale and brown weathering calcarenite.
- 3) Calcarenite - Brown weathering, lower surfaces appears to be a disgested ss [burrowed]. The upper surfaces are finely laminated - 4-6" beds of ss with interbedded silts and clays, 5'.
- 4) Shale, blue-gray in part covered 12'.
- 5) Limestone, similar to #1 below, pebbles are 1/2" in diameter however; Near top is a good fusuline zone - this horizon divides vertically to the west - the upper part forming King's bed "4", 16'.

PG. 41

{note: illustration:

- bed 1: 16'; 7/3/57/1
- bed 2: 25'
- bed 3: 5'
- bed 4: 12'
- bed 5: 16'; 7/3/57/2; Top of King's #2 (gray) limestone(?)
- bed 6: 163'}

6) Covered 163' - How many beds are covered here is only guesswork - The value of this interval is of comparative proposes only.

7) Limestone, massive gray weathering, a shell hash which shows very little transportation. Coral, (long slender tetracorals), bryozoans, isolated fusulines, brachiopods, crinoid stems.

lower 18' massive - upper 5' in 6" to 1' beds. 7/3/57/3 total 23'.





8) Covered, 21' - shale?

9) Limestone, blocky - yellow-brown weathering, 6" to 1' beds, 2.5' to 3'? - Can't see any rubble base, top is planar, but lacks lamella upper 2' or 3'. Shell hash.

PG. 42

{note: illustration:

bed 6: 163'

bed 7: 23'; 7/3/57/3

bed 8: 21'

bed 9: 2.5'; 7/3/57/4

bed 10: 2'

bed 11: 6/3/57/5

bed 12:

bed 13:

bed 14: 7/3/57/7}

10) Covered 2'

11) Limestone, same as 9, 8-12"

12) a) shale ? 6" to 1'

b) rubbly, conglomerative (1/2" to 1" pebbles) organic frag. Limestone 2' (silicified fossils common)

c) Limestone, coarse size organic frag. even top bedding surface 2'.

The beds above 12 form irregular steps on the dip slope to the NNW. Biohermal deposits cause the irregularity in the 6" to 2' beds - 15' to 20' of strike on the dip slope of this ridge which are above bed 12 and not covered by alluvium.

PG. 43

Fault strikes N15W - 25' strat displacement east apparently lowered. This fault is 100 yards +- east of section 5.

This afternoon I tried to trace bed 11, section IV around to section V. Bed 11 is eroded away about in line with place where the lower part of section gets mixed up at the first turn in Geol. Canyon. The upper surface of bed 11 is nearly completely covered with fusulines - The next lower limestone coquina in Section IV, bed 9, I don't believe has this great population of fusulines. After losing bed 11, I drop down to what I believe is bed 9, at least the stratigraphic interval is about right. Then to bed 8? back to 9? then a biohermal limestone, then a crinoidal limestone, finally to a limestone with a reasonable number of fusulines 11? About 300 yards from where I first lost 11. If this bed is #11 of section IV then it is about 15' to 20' higher with 2 additional limestones in between.

Perhaps several more. (ie, a chert separating 2 from vuggy zones, capped by a limestone).

13) Covered 4'

14) Limestone, brown-yellow weathering, silicified fusulines and gastropods, some echinoid? spines.

PG. 44



This unit 14 is what I believe is equivalent in lithologic connection to bed 11, section IV.

PG. 45

7/3/57

Morning went to Alpine to see about some photographs; SCS didn't have very good ones, so sent for U.S.G.S. photos.

Sampled from Section V

7/3/57/8 - a rock sample from about 100 yards east of section V, from the third unit: at this point unit 3 is dipping  $26^{\circ}$  S45W. It is truncated by unit 5 which is dipping about  $10^{\circ}$  N45W.

7/3/57/9 - from Uddenites zone west side of Geologist's Canyon, loose specimens. I believe the goniatites are fairly high, pelicyrines also.

7/3/57/10 - from top of #2 limestone outlier - on dip slope.

7/3/57/11 - from top of a limestone in Geol. Canyon. The question is if this is a Gaptank limestone then it would appear the #2 gray member of King's is not present here as much more than rubble at the base of his #4 bed. This is the first limestone going up stream after the creek makes the major swing to the east.

PG. 46

The slope on the rather flat top of the Gray Limestone outlier lines up pretty well with the reefy beds across the Canyon. If there is a fault zone in the lower portion of Geologist's Creek it can't be very great. I personally believe any discordance can be explained as slippage in the shale (Uddenites) zone carrying the Gray Limestone member down. This seems to be the result of a syncline in the upper gaptank beds which in this and the case of p. 26 apparently control the placement of streams. The gray limestone may either thin to the west, or the unit may change lithology and add shale between 2 limestone horizons, paleo will need to be checked. If the #1 bed of Section V is Gaptank and the silty sand would fit nicely as the Uddenites zone. It would seem from the top of the Gray Limestone outlier that bed 4 maintains as fairly constant interval with bed 5 of Section 5. I would put this at about 10-12' or just about the displacement of the little N-S fault.

PG. 47

If the fault up Geologist's Canyon is for real, the collection from 7/3/57/11 should be Gaptank; I suspect however it will be found to be Wolfcampian. If it is Gaptank it can be easily explained as a bed truncated by the reefy beds of the #2 gray limestone above and then by the #4 bed of King near the creek beds. At this time it seems significant that the large central part of reefs are contemporaneous and are on or near the top of a Gaptank anticline. The Uddenites zones under the outlier suggests it to could be an anticlinal or at least a high area.

The fossils I found today in the Uddenites zone indicate near shore deposition. The wood in all probably is too cemented to have been carried very far to sea,



the pelcypods are small but of a mud burrowing type judging by the elongate siphonal ends of the interval casts. The gonitites may suggest normal marine salinity but this point will require further checking.

The question of structural warping of the limestone in the outlier of King's Gray Limestone

PG. 48

member, I believe is an illusion. I think that there were two reef heads which filled the area between them by debris from lenticular beds. The nearly flat upper surface with 2 or 3 feet or more beds extending nearly the whole length of the outlier would further suggest this. The collection of fusulines (7/3/57/10) I believe indicate slightly less turbid water (deeper?) giving these shells and smaller shell frags a chance to accumulate in well bedded strata.

Pictures 4 and 5 are of the area of the smaller Gaptank anticline and the slumped #2 gray limestone.

Pictures 6 and 7 are of the lower part of the western W.C. fans in the Hills proper. July 4, 1957 - Holiday in Marathon!

PG. 49

7/5/57

Section 21

Section VI - about halfway between section V and IV.

- 1) Limestone gray, massive in 3 to 5' beds, conglomerative on the upper surface, but only slightly. Base of unit not observed.
- 2) Covered 6' - stream bed.
- 3) Limestone, yellow-brown weathering, organic frag. (crinoid fusuline) medium size quartz sand on upper surface, well rounded, but not frosted, 2', upper surface is flat. 7/5/57/1
- 4) Covered 16' - probably a shale interval with at least one perhaps more nodular limestone rubble beds.
- 5) Limestone, yellow-brown weathering, gray fresh, organic frag. (fusulines, crinoids) replacement quartz in geodes, quartzsand upper surface. The quartz sand seems to have been washed across the limestone and some quartz stuck to the limestone surface - fusulines are bedded in this ss layer. 1'.

PG. 50

- 6) Covered 5', probably gray shale and limestone rubble.
- 7) Limestone, brown-gray on fresh surface, orange-brown weathering shell hash of crinoids, fusulines, bryozoans. Progressively finer grained near top. Upper surface is flat. 1'.

7/5/57/2.

- 8) Shale, black to blue, slightly silty, has slight fetid odor. 35', brown and variate silt zones

1" occasionally - (bentonite?).

{note: illustration:



bed 3: 7/5/57/1  
bed 7: 7/5/57/2  
bed 8: 7/5/57/3; 7/5/57/4; 7/5/57/5}

PG. 51

- 9) Covered, 53'.  
10) Limestone, yellow-brown weathering, (gray fresh) organic frag. (crinoid) - I'm not sure this unit is not slumped down from above. 3'.  
11) Covered, probably shale in great part. A lot of limestone rubble in upper part - 37'.  
12) Calcarenite, brown-yellow weathering; some sand (quartz) and upper surface loaded with fusulines, but seem restricted to upper 1". 2.5'.  
13) Limestone, rubble for most part, pretty badly covered and it is possible that there are several shale intervals. 26'.  
14) Limestone,  
    a) Calcarenite, brown-yellow weathering; medium sand size through out 2.5 to 3.5 feet; flat top.  
    b) shale parting 2" to 3", gray shale  
    c) Limestone, conglomerate at base grading up to coarse sand sizes, organic frag.  
    Crinoids, brachiopods, corals, bryozoans, 5.5'.

PG. 52

{note: illustration:

bed 16: 7/5/57/9  
bed 18: 7/5/57/10  
bed 19: 7/5/57/11  
bed 22: 7/5/57/12  
bed 25: 7/5/57/13  
bed 26: 7/9/57/3  
bed 27: 7/5/57/14  
bed 28: 7/5/57/15

bed 13: 7/5/57/6  
bed 14: 7/5/57/7  
bed 15: 7/5/57/8; 9/27/57/3}

PG. 53

- 15) Biohermal nodule - lower few inches maybe shaly and then rubbly limestone, great part is limestone, gray, (weathering - yellow-buff). Corals, brachs, sponges(?), fusulines. 10'.  
16) Covered 14' on dip slope of 15+14. 14 (10/99 this seems = 12' to thin).  
17) Limestone, fine pebble conglomerate, organic frag. of which fusulines seem to dominate, bryozoan 3', finer grained near top, flat upper surface.





- 18) a) covered 4', probably gray shale  
 b) 4" brown weathering calcarenite and sand (quartz)  
 c) gray shale 6'  
 d) 2" orange-brown silty calcarenite  
 e) 6' gray shale  
 f) 3" bed like b.  
 g) covered 7', gray shale probably
- 19) Limestone, orange-brown weathering conglomerate (limestone) in part, pebble to coarse sand in top 6", more yellow and rubbly near bottom 3'. Organic fragmental; quartz sand on upper flat surface, scattered fusulines also.

PG. 54

- 20) Covered 10' (shale probably)
- 21) 4" to 8" brown(orangish) calcarenite with quartz
- 22) 5' covered (shale probably)
- 23) Limestone, calcarenite medium to fine, progressively to top. The upper 5" are well laminated, flat top, 1'.
- 24) a) Shale, grayish-brown 3'.  
 b) 1" brown(reddish) calcarenite and siltstone - well laminated, very fine quartz sand also.
- 25) a) shale, gray 5'.  
 b) 4" calcarenite - some quartz very fine to fine grained
- 26) a) Shale, gray 4.5'.  
 b) 6"; like 25b
- 27) Covered - 30' probably shale and at least 2 calcarenite beds.

PG. 55

- 28) Calcarenite, rubbly in lower 1.5', organic frags; become progressively better laminated in upper 6", flat top surface. 2', some quartz very fine sand size on top surface.
- 29) Covered 41', several calcarenites with gray shale probably.
- 30) calcarenite, organic frag. (brachs, fusulines, crinoids) 10" flat surface is not striking on this bed; wood fragments. Collection 7/5/57/16.
- 31) Covered 18' - probably gray shale.
- 32) Marl, silt and clay in matrix and as coarse sand fractions. Has a well laminated upper 2" with flat top. Sort of a transition between influence of source over environment of deposition 21'. Collection 7/5/57/17.
- 33) Covered 31'.
- 34) "Hess" Conglomerate 30'+.

PG. 56

7/6/57

Section 19

Section 7 - low hills to west of Wolfcamp Hill. The line of section runs due North.



Covered below

- 1) Calcarenite, pebbles 1.5" to 2" max, Calcarenite sand matrix and Calcareous cement. Fossiliferous (Crinoids and fusulines), bedding 1' to 1.5'. Flat top 4.5' gray fresh, light yellow-brown weathering.
- 2) Covered 5.5' probably shale or weakly cemented rubble.
- 3) Calcarenite, with a few small pebble, fusulines bryozoans and crinoids common. Quartz sands in upper part, 18", flat top. Yellowish-brown weathering.
- 4) Covered 17', probably shale and 1 or 2 calcarenite beds (less than 4-6" thick).
- 5) Calcarenite, brown weathering, some quartz sand 8" thick.

PG. 57

{note: illustration:

bed 1: 7/657/1

bed 9: 7/6/57/2; 7/6/57/3, loose}

- 6) Calcarenite, gray-brown weathering, shell hash, fusulines, crinoids and brachs. Lower part of unit is a shale which grades into a limestone rubble, then into a well sorted frag. limestone. Upper surface is planed flat. Total 5'.
- 7) Covered 8' - gray shale and some silty calcarenite.
- 8) Calcarenite - well graded medium sand, a few fusulines (small) and stem joints of crinoids - several beds in a 4' interval.
- 9) Covered 76'. The lower 20 feet is probably mostly blue-gray shale. The upper 15' probably mostly limestone rubble.

PG. 58

- 10) Calcarenite, 2" diameter pebbles, some crinoids and bryozoans a few fusulines, brown weathering , gray on fresh surface 4'.
- 11) a) shale break - 1'.  
b) 4-6" well sorted Calcarenite, laminated upper 2", flat upper surface.  
Total 1.5'.
- 12) Covered 24' - probably shale (gray) - 1 or more brown calcarenites maybe present.
- 13) Calcarenite, brown weathering, lower part a shell hash, a shale break and then the well sorted 4-8" calcarenite laminated bed. Total for unit 4.5'.
- 14) Calcarenite, (limestone rubble) [The main difference between the "so called" rubble and what I've been calling limestone conglomerate or calcarenite seems to be the cementing material. In the "rubbles" the cement is clay and it weathers to a yellow or yellow-brown] gray and mottled brown weathering. 18' in 6-18" beds.

PG. 59

{note: illustration:

bed 14: 7/6/57/4

bed 19: 7/6/57/5}



15) Calcarenite, brown weathering, frags in lower part fine pebble to coarse sand sizes, progressively finer toward top - medium sand size at top. No apparent lamination. 3.5'.

16) Same as 14, rubble, 5.5'.

17) 3" shale break. 1.5' of calcarenite like 15.

18) Like 14, rubble, 4'.

19) Like 10, conglomerate, 1.5' but pebbles 1-1.5" diameter.

PG. 60

20) Mostly covered, 7'; at least 3,4" brown weathering calcarenites, the rest is probably gray shale.

21) Like 19, conglomerate, the upper .5' is well laminated, has some black chert in seams 11 to bedding, 1.5'.

22) Calcarenites and gray shale - 3, 6" to 1' calcarenites, brown weathering. Crinoidal and fusulines fragments, 4 gray shales 1' to 1.5'. Total 11'.

23) Limestone, gray weathering, biohermal reef. 17', upper part is crudely bedded in 2' units lower part is "rubble".

24) a) 2.5' gray shale

b) 0.5' calcarenite, brown weathering (like 15)

25) like 24 a) 1.5' shale

b) 1' calcarenite

26) like 24 a) 6" shale

b) 6" to 2" thins to east, calcarenites

PG. 61

{note: illustration:

bed 22: 7/6/57/6

bed 30: 7/6/57/7}

27) as 24 a) 1.5' shale

b) 8" to 4" calcarenite

28) Calcarenite - lower 1' rubble as 14, but 21' as 15. calcarenite

29) as 24 a) 1.5' shale

b) 2.5' calcarenite

30) as 24 a) 4' shale

b) 6" calcarenite

31) as 24 a) 2' shale

b) 2.5' calcarenite

PG. 62

32) Shale gray, 5.5', 2 calcarenite bands, 2" to 4" thick, fine grained.

33) as 15, 2.5' calcarenite

34) a) shale gray 4" to 8"

b) gray limestone, shell breccia, calcarenite 6" to 1'.

35) 6.5' - like 14 lower 5', like 15 upper 1.5'.

36) Shale gray, mostly covered [4'] <-- 14'?



- 37) Calcarenite orange-brown upper surface, flat 1'.
- 38) Mostly covered 2, 4" calcarenite beds at 4' and 10' are exposed. 32'.
- 39) Calcarenite "rubble" black of gray limestone 6" diameter brown mottled zones with crinoids and fusulines in them. Beds 1' to 3', occasional evidence of the beds being well sorted and laminated at top - 2 observations.

PG. 63

{note: illustration:

bed 38: 7/6/57/8

bed 39: 7/6/57/9}

- 40) Covered 11' probably less resistant limestone rubble.
- 41) like 39, 26'. The calcarenite making the top bed in this sequence is well sorted and bedded, well cemented, flat top.
- 42) Covered 20'. <-- 40'?
- 43) Calcarenite, well cemented, yellow-brown, 1.5" diameter pebbles, becoming fine grained in upper 3" flat upper surface. 3.5'.
- 44) 16', lenticular calcarenites. These are interbedded with shales, 50 yards to west I could find only 3 or 4 relatively thin beds.

PG. 64

- 45) Covered 64'.
- 46) Gray shale, some interbedded orange and brown sandy siltstone. 53' covered to a large extent.
- 47) "Hess" Conglomerate. 8', Calcarenite with a large number of dark chert and quartzite pebbles - 4" to 5" diameter.

{note: illustration:

bed 43: 7/6/57/10}

PG. 65

Collection 7/6/57/12 from a yellow weathering conglomerate about 6' below bed 47 - It seems to differ from bed 47 in yellow color and that's about all. 2-3'.

{note: illustration:

bed 46: 7/6/57/11; 7/6/57/12}

The zone of biohermal limestone, #23, seems to carry through pretty well. I believe that #23, section VII, is equivalent to #15, section VI, and to #7, section V.

PG. 66

7/7/57

Big Bend Park.

The first collection is from same horizon as is the John Wilson Eocene Dinosaur exhibit just before reaching park RIQs. 7/7/57/1 (This is only a few 10's of feet above the upper K contact).





7/7/57/2 along Willow-Creek, Terlingua Quad. North 13', west 32'. This is probably Gulfian.

{note: illustration:

- bed 1: covered
- bed 2: 15', marl
- bed 3: 3', clay
- bed 4: 35', massive Ss.}

PG. 67

7/9/57

Section 19 cont.

Wolfcamp Hills - Continuation of Section VII.

48) Shale, very silty, grades into a 6" sandy siltstone. Light yellow-brown weathering. 3'.

49) Conglomerate, fine sandy matrix, poorly cemented, 1/2" diameter pebbles - a few 2 to 4" bands of greenish-gray siltstones. 6'. Collection 7/9/57/2.

50) Conglomerate, 3" to 4" cobbles at base of a subunit. The subunits grades into a ledge forming (indurated) fine sandstone. 3 or 4 such subunits observed. Top of each subunit is rather planar. Coarse conglomerate rest right on top of this planar surface. 14'.

51) Shale and siltstone, gray to yellow-brown, 5'.

52) Sandstone, yellow-gray weathering, in 4" to 10" beds with 2" silt partings. 16'.

PG. 68

{note: illustration:

- bed 49: 7/9/57/2
- bed 53: 7/9/57/1}

PG. 69

53) like #50, 0.5" to 1" pebbles, 5'. This grades laterally into 6' of gray and yellow shale and siltstone. Collection 7/9/57/1.

54) Sandstone and conglomerate 3" to 3' lenticular beds. Conglomerate 2" diameter max. Sand is mostly calcarenite, 10'.

55) Covered 6' - mostly gray to greenish gray siltstone.

56) A multicyclic (?) unit like #50, 3" cobbles 1' to 1.5' per subunit. 9', calcarenite sandstone a very fine to fine size.

57) Sandstone - very silty, and very fine sand size greenish-yellow-brown weathering, 3' rudite ledge 1/2" to 1" pebbles, 4.5'.

58) Calcareditite and calcarenite - 4" to 6" split parting 2' gray to slightly yellow-gray weathering.

59) 57' covered.

PG. 70

60) Metamorphosed limestone, and some baked shale 5'.



61) Rhyolite? sill. Top of Section cont. King Sect. 24?

Collection 7/9/57/3 - from ant hill on small WC knoll, in about horizon of #25 or #26 of section VII.

Collection 7/9/57/4 - dark gray limestone in slope of #2 (Gray Limestone) of King Outlier - SE flank. 1/3 of way up from gate - I doubt if it is in place. {note:

illustration:

bed 1: 10', 7/9/57/5

bed 2: 45', 7/9/57/4

bed 3: 60'

bed 4: 25'

bed 5: 45'

bed 6: 20'}

yellow calcaedite, has dark grey limestone cobbles, rusty fine sand and silt matrix.

PG. 71

Section 26

Section 8a - 2.5 miles NE of (Taylor) Neal Ranch House lower part of section badly covered.

- 1) Sandstone, very fine size, yellow weathering - Tetracorals, brachiopods, sponges?, fusulines?. This bed is fairly porous and most fossils are empty molds. 1' to 2'.
- 2) Covered 12'.
- 3) Limestone, gray, shell hash, brachs, crinoids, fusuline 9'. Collection 7/9/57/6, 4" to 1' bedding. At top of unit a bed like #1 is capping.
- 4) Covered 29'.
- 5) Limestone, gray at bottom (2') <-- 7/9/57/7, 42' above are gray-brown weathering dolostone no fossils identifiable. 2" to 4' beds.
- 6) Covered 14'.
- 7) Dolostone, yellow-brown weathering. 1' to 3' beds, 12'.

PG. 72

Section 8a runs up a small slope. The various angles of bedding and covered intervals between these outcrops are suggestive of some structural disturbance. Section 8b begins on what I believe is bed 7 of 8a.

8) 69' covered.

9) Sandstone, poorly undulated, very fine sand size, some silt, well sorted however, CaCO<sub>3</sub> is common as sand grains - greenish-gray shale yellows. 36', 1" to 3" beds.

10) Limestone, nodular uneven bedding, 3" to 6" beds. Collection 7/9/57/10, 3' above base. 38' (See page 21) Collection 7/9/57/11, 15' above base.

11) Siltstone, pebbly, yellow weathering, some bands are more pebble than silt! 15' poorly cemented.

12) Siltstone with pebbles - siliceous cement 2'.



<-- Neal Ranch Fm. <-- Gaptank Fm. (applied to #9-#12)

PG. 73

Section 26

- 13) Shale and siltstone (10') green-gray colors, 2, 6" welded siltstone (siliceous) near top.
- 14) Sandstone, very fine to fine-grained, siliceous cement. 2'.
- 15) Shale 9' green-gray "bumpy", mostly covered.
- 16) Siltstone with siliceous cement, 6" to 2' beds - 2" to 6" shale on silt partings, buff colored. 11'.
- 17) Shale (and some siltstone), in beds 6" to 1', siliceous siltstones, in 4" layers 10'. Collection 7/9/57/12.
- 18) Covered 26'.
- 19) Siltstone, siliceous buff - [2']
- 20) Limestone, yellow weathering 3' - brown blotches where there were once fossils, very silty.
- 21) Covered 16'.

PG. 74

- 22) Sandstone, pinkish-brown, well and thinning laminated - calcarenite. 6".
  - 23) Covered 30'
  - 24) Silty, brown-orange weathering, dolostone. 4'. It was fossiliferous.
  - 25) Covered [25' +/-], above that Coarse Calcarenite. 40' or more.
- Brooks Ranch Mbr. Lenox Hills Fm. <--|<-- Neal Ranch Fm.

PG. 75

Section 27

7/10/57

C. Brooks Ranch SW exposures. Also over the fence on to part of the Neal Ranch.

The limestone cliffs on the NE part of the Neal Ranch are lithologically continuous with the interval #3 through #7 of Section 8a. The #9 unit thickens and thins but seems to be fairly continuous throughout. Section 9 (Sect. 27)(dip 7°-10°) (N) {note: illustration:

bed 1: covered

bed 2: 30'; several yellow-brown weathery ledges - would like to call this

Uddinites

zone based on color and characteristics of the sandstones;

7/10/57/4

bed 3: 15'; gray limestone - very dark brown; 7/10/57/3

bed 4: 18'; covered; some brown-red shale

bed 5: 23'; biohermal and shell hash, gray; 7/10/57/2

bed 6: very fine sandstone with silt 6" greenish-gray

bed 7: 34'; algal limestone bioherm, gray



bed 8: 4'; covered  
bed 9: 6'; gray; 7/10/57/1}

PG. 76

Section 29

Section 10 (dip 10°) (N)

Covered below-float looks like bed #2 section I.

1) Limestone, organic fragmental, crinoids brachiopods weathers light gray with tinge of yellow. 2 rubble zones near base -

- a) 14' massive
- b) 3' in 1' beds
- c) 5' gray and yellow massive

Top Gaptank

2) Covered 7' some gray-shale, probably all is!

3) Sandstone, very calcareous (grains)  $\text{Fe}_2\text{O}_3\text{H}_2\text{O}$  acting as cement? weathers deep yellow brown. 3'. There are surfaces coated with crinoid frags.

4) Shale gray with few gray siltstones and very fine sandstone grading upward into dominant silt and sand over the shale - unit is essentially gray weathering throughout, becoming slightly yellow near top. 139'.

PG. 77

{note: illustration:

bed 1: 22'; 7/10/57/5  
bed 2: 7';  
bed 3: 7/10/57/6}

5) Sandstone fine grain, yellow-orange weathering, 3" to 8" beds, even bedding, nearly uniform size and color throughout unit. Total 53' Upper 3' are in 1' beds, paler colors than below.

6) 15' covered.

PG. 78

7) Limestone, gray, rather fine shell hash. Mostly brachiopod fragments recognizable. 8'.

8) 14' covered.

9) Limestone, gray massive, shell hash, 2 beds 6' separated by 6" of limestone rubble. 12.5'.

10) Covered impart - most is a less resistant nodular limestone gray-brown weathering, brachiopod hash. 23'.

11) Limestone, gray massive biohermal 28' ( \_?\_ )

12) Covered 5'.

13) Limestone, gray, rubbly at base 2.5' fine hash.

14) Covered - 4'. {note: illustration:





bed 13: 7/10/57/7}

PG. 79

15) Calcarudite, cobbles 4" to 6" diameter, (largest); light brownish-gray weathering limestone matrix. This looks like the "Hess Conglomerate" in the Wolfcamp Hills 15' plus (eroded upper beds).

Colored Picture 24 or 25 - of a "typical" (2) cyclic sequence of Wolfcamp.

1) gray-yellow shale Collection 7/10/57/8

2) silty and full of fusulines

{note: 1 and 2 (2' to 3.5')}

3) limestone rubble 1'

4) calcarenite 8"

5) calcarenite 2'

{note: 4 and 5 (orange-brown weathering)}

This is probably not typical of the Wolfcamp Hills, but seems typical of eastern exposures on Brooks Ranch.

PG. 80

Section 30

Section 11 - Near earth tank 1 mile +-, west of Brooks Ranch, begins at top of Gaptank limestone.

1) Limestone, (Gaptank) (dip 7°N) dark gray weathering, 8' massive upper part contains 1/4" to 1/2" gravels calcaredite only in upper part.

2) Covered 11'.

3) Limestone, shell hash, but not readily identifiable 1' Collection 7/1/57/9 fetid, black on fresh surface, weathers dark gray with spots of iron stain. [Coll 30-3].

4) Sandstone, very limy, light yellow to orange weathering, 6" to 1' beds, 34'.

5) Covered, probably gray shale 27'.

6) Calcarenite, gray weathering, fine sand size, and quite a bit of siliceous silt sizes. 1" to 6" beds, irregular bedding 15'; 7/10/57/10 [Coll. 30-6].

7) Limestone, blue-gray weathering, massive brach frags but very fine grained. 4'.

PG. 81

{note: illustration:

bed 3: 7/10/57/9

bed 6: 7/10/57/10

bed 8: 7/11/57/8}

8) Limestone, light gray to light brown or tan weathering. Beds 2" to 6", uneven or rubbly. Fine grained for most part, (no large frags), several intervals are covered, but seems to be less resistant limestone rubble. 23'.

9) Covered 17'.



10) Limestone, blue-gray, sort of rubble, but almost a calcarudite. Darker "pebbles" are in a lighter matrix, but the difference seems to be one is reticular around the other, not good pebbles. 22', 1" to 8" beds 7/10/57/11. [burrowed??] [weathered??]

PG. 82

{note: illustration:

bed 10: 7/10/57/11

bed 13: 7/10/57/8

bed 17: 7/10/57/12

bed 19: 7/10/57/13}

11) Limestone, light gray weathering, massive, fine grained, 11'.

12) Limestone, shell hash, weathered mottled gray and brown, crinoids, bryozoans, a few brachs, 1/4" to 6" beds. A few inches of shale at the base of this unit. Top of unit has brown weathering color characteristic of the middle and upper Wolfcamp cycles. 15'.

13) Shales in lower part (5' to 7'), becoming more silty and sandy, fusulinid sandstones in upper 2' to 3', 1' shell hash. Collection 7/10/57/8 see note on picture p. 79, 18'.

PG. 83

Between unit 12 and 13 slicken-side surfaces were seen cutting the down dip exposures of bed 12, no major displacement has taken place, but this seems rather to be the adjustment to a slight Post Hess warping forming a gentle syncline near the tank.

14) Calcarene, yellow to orange-brown weathering quite quartz, rich and might be best considered as a quartz sandstone. 2.5'.

15) Cycle -

a) 4' gray shale

b) 1' like #4 below (at top)

16) Gray shale 9'.

17) Sandstone yellow weathering, 1' beds on less; 16' The fine sandstones have a great deal up to 40 or 50% fusulines, crinoids, gastropods, 7/10/57/12.

18) Covered, probably continuation of 17. [15'?

19) Limestone, weathers gray to brownish-gray, shell hash, brachs, some fusulines. [12'?] 7/10/57/13.

PG. 84

20) like #19, 7'.

21) Sandstone, very fine high CaCO<sub>3</sub> 4' greenish-yellow.

22) like #19, 21'; changes to dolomite along outcrop (100').

Although no Conglomerate beds were found, I believe beds 19-22 are in the same interval as the "Hess" Conglomerate of section 10. [probably a matter of pre-Hess topographic relief.]



The absence of "Conglomerate" bed in the lower Hess in Section 8 and in Section 11 leads me to believe the conglomerate in the Wolfcamp Hills and in section 10 are local lenses and not a good mapping horizon. The light gray limestone at the approximate level of these conglomerates appear to be a fairly consistent outcropping horizon. Without the benefit of fusuline evidence I would at this time suggest the beginning of silty and fine to very fine sandy bed above the highest "cyclic" Wolfcamp in the Wolfcamp Hills seems to be a persistent unit also, although it is often obscured by talus.

PG. 85

The upper beds of the Wolfcamp are apparently missing in the western portion of the Brooks Ranch as a result of erosion. The limestone cliff forming Wolfcamp units is probably equivalent to the #2 gray limestone member of King in the Hills proper. Upper Wolfcamp Cyclic deposits were observed on the Brooks Ranch (to be measured later) and also at section 11.

The Gaptank limestone becomes the prominent cliff (no it doesn't) former in the low - builds east of section 11 because of thinning of the #2 gray member of King and also because of some thickening of that (gaptank) unit to the east. {note: this paragraph was crossed out}

The upper Wolfcamp beds in Sect 11 are in a structural low and show evidence of being deformed slightly prior to Hess limestone deposition.

PG. 86

7/11/57

Section 28

Covered below Section 12; at head of draw northwest of section 10.

- 1) Limestone, gray, massive beds, 3 to 20' bedding biohermal, rather fine fragments - 51'.
- 2) Covered 7'.
- 3) Limestone, gray, uneven bedding near base, more massive higher. Gray weathering. Crinoid stems and fusulines near base. 3'. 7/11/57/1.
- 4) 1' covered.
- 5) Calcarenite, yellow-brown weathering, brown-gray on fresh surface. Some fusulines and brach shell fragments - 1.5', 7/11/57/2.
- 6) Covered 2'.
- 7) Calcarenite, yellow-brown weathering some mottled grays, coral and crinoid and brachiopod fragments. [1']
- 8) Covered, gray-brown shale probably, 1.5'.

PG. 87

{note: illustration: Section 12:

bed 3: 7/11/57/1

bed 4: 7/11/57/2 {notes beds4-7: 5.5' total}



beds 8-11: 5' total}

- 9) Sandstone, fine grained, yellow to gray-brown weathering, 6" (calcareous-quartz).
- 10) Shale gray, mostly covered 2'.
- 11) Sandstone, fine grained, orange-brown weathering, calcareous-quartz. 8" to 1'.

PG. 88

- 12) Shale, brown to gray with 1" to 3" beds of siltstone and sandstone (fine) poorly indurated. 22'.
  - 13) Covered 23'.
  - 14) Sandstone, brown to yellow weathering in 3" to 6" beds, gray on fresh surface. Calcite cement and some calcite grains <30 to 40%. Crossbedding 1/2" to 1" fine to very fine sand well sorted; I believe this to be either eolian or back beach, maybe a little of both. 27'. 7/11/57/3.
  - 15) Covered 18', limestone rubble?
  - 16) Dolostones, 45'+ brown weathering.
- Above are undoubted Hess beds of general position and lithology in 19 through 21 of section 8b.

PG. 89

Section 28 contd

{note: illustration:

bed 14: 7/11/57/3}

Really need to work this out on photos!

PG. 90

Section 31

Section 13a - 1/4 mile east of section 11, up front of lower ridge - To top of hill 4752 Section 27 of King.

- 11) Limestone dark gray, (Gaptank) looks like biohermal rubble - 3" to 4" diameter blacks 5.5' massive 7/11/57/4.
- 12) Limestone, rubble, dark gray, in 3" beds, very uneven 1.5'
- 13) Limestone, like #1, upper 3' is 8" to 1' beds, lowers 9' massive, weathers to irregularly pocketed, but rather smooth masses. 7/11/57/5.
- 14) Sandstone, fine grained weathers orange to yellow-brown, some green color in patches. 3" to 6" beds; 3.5'.
- 15) Covered, but seems to be a dark red-brown shale zone - This is same color as is at top of Wolfcamp 3/4 mile west. 7/11/57/6, 7'.
- 16) Calcarudite - all sizes, up to about 2" diameter. Small pieces of Tensus? chert and other cherts, subangular to subround. Upper 1' organic frag. 9'.

PG. 91

{note: illustration: Section 13a:





bed 12: 7/11/57/4  
bed 13: 7/11/57/5  
bed 15: 7/11/57/6  
bed 17: 7/11/57/7  
bed 18+: Lenox Hills}

17) Mostly covered, limestone rubble, purples, grays, yellow-browns - 5" to 8" beds. 28'.

7/11/57/7.

18) Calcarudite, cobbles 6" to 10" diameter; mostly limestone cobbles, but a few large chert cobbles and quartzite also. In 3' to 6' beds - cement in limestone weathers yellowish. 45' to top of ridge.

PG. 92

Collection 7/11/57/8 from the zone of #8 and #9 units in section 11. The limestone have changed to calcarudites and appear much thinner. They seem to thin rather than being entirely truncated at section 13. This collection is from a saddle on the northwest side of the Ridge Section 13 is on.

Collection 7/11/57/9 from Gaptank limestone, dark gray (upper most Gaptank limestone) 2 bags, one of softer interbeds, one of dark limestone. The stream gully on Brooks ranch 1 mile west of Ranch House.

Remark - It certainly isn't like P. King mapped it.

PG. 93

Section 31 see King's Sect 27.

7/12/57

Section 13b - Below unit 1 of Section 13, there is an exposure of gray-brown shales and orange sandstones. Whether this is a zone in the gaptank or the illusive Uddenites zone is the major concern. The field evidence to date would suggest to me it is a zone in the Gaptank - (These are vertical distances, dip 10° to the north.)

1) Limestone, dark gray, organic fragmental, mostly brachiopods and crinoids - 25'.

2) Covered 20'.

3) Limestone, yellow weathering, dark gray fresh surface, organic fragmental - see collection 7/12/57/2, 1'.

4) Covered 12'.

5) Limestone, black to dark gray, organic hash, 1.5'.

6) Covered - 28' probably mostly of #5 lithology.

PG. 94

7) Sandstone, light orange-brown weathering, much quartz; cross bedding, sizes not well sorted, probably fluvitih deposition. This unit appears to be truncated to the west by unit #8. 21'; in 6" to 3' beds.

8) Limestone, dark gray, organic fragmental very uneven lower bedding plans, 3' to 5' of relief cut into truncated edges of #7. 11'.



- 9) Alteration of Calcarenites and brown gray shale, Calcarenites become very fine pebble conglomerate higher in unit; 55' to 60' interval is badly covered.  
10) Covered, 40' to base of Section 13a unit #1.

PG. 95

{note: illustration: Section 13b:

bed 8: Collection 7/12/57/3

bed 1: 7/12/57/1

bed 3: 7/12/57/2}

PG. 96

{note: illustration: Conolyn Brooks Ranch: see illustration for notes}

PG. 97

Section 34 (part)

Section 14, 3/8 mile west of C. Brooks Ranch House.

Covered below

- 1) Sandstone, light orange-brown weathering.  $\text{CaCO}_3$  cement in part, a few grains of calcite 6" to 2' to 3' beds - 38'. (see unit 7 Section 13b).
- 2) Shale, gray to brown with 2 beds (1') like #1. 17'.
- 3) Limestone silty and sandy, but abundant fusulines weathers light tan or yellow. Brach shells also abundant. In 3" to 6" bed, uneven bedding surfaces. 29'. 7/11/57/4 NO!  
7/28/58/1 check samples 7/12/57/4
- 4) Covered, 55': If other side of gully is compared, this interval is a massive calcarenite, gray weathering with indistinct 6" to 6' beds. It caps that ridge but not the one the section climbs. (Fault?)
- 5) Limestone, gray mottled colors, darker "pebbles?" in a lighter matrix; 1.5' to 3" beds irregular bedding planes 18'.

PG. 98

- 6) Limestone gray massive, 44' crinoid fragments, brachiopod shells.
- 7) "Hess" Conglomerate about 10' above this last unit 6. This is on a dip slope so it is difficult to set the interval between the top of #6 and the "Hess" Conglomerate, but it is within the 10'.

Along the front of the central segment of the Brooks Ranch Wolfcamp ridge most of the drains are the result of erosion in the zones of weaknesses caused by faulting. These faults have throws of 10' to 50'. The limestone ledges back of the ridge have several zones of slicken sides which I interpret as movement on bedding planes as the Wolfcamp limestone was arched during later. Marathon basin movement. Probably past K all though I have no direct evidence for the time of movement. The faulting perpendicular to strike cuts the Hess and



Leonard so that it aids in draw forming there also. The remnants of K caps are apparently protected by differential movement on (cont. on page 98)

PG. 99

Section 24 (see pg. 163 of book 2)

Section 14

{note: illustration: Section 14:  
bed 3: 7/12/57/4}

cont. from pg. 98

these faults and can be explained in this manner.

The evidence in section 13 suggests that the Gaptank and the Wolfcamp limestones either converged and form a combined mass of limestone, or that the Wolfcamp is lacking. The study of section 14 indicates there is more to this than at first meets the eye. I believe based only on lithology that unit 3 of section 14 is the same unit as #1 of section 13a. The #1 and #2 beds of section 14 are probably the same as bed 7 of 13b. The #8 beds of 13b may

PG. 100

cont. from pg. 99

however be equal to the #3 beds of section 14.

The fusulines may tell us the answers, but if the middle of Section 13b is the Uddenites zone what happens to the Gaptank limestone between section 11 and section 13?; is what I've been calling Gaptank in the western part of the Brooks Ranch really King's #2 limestone member in the W.C.H.s? You know, Charlie this could be confusing.

Another question is what is the red horizon of interval which some places seems to separate the massive Wolfcamp limestone (King #2?) and the "Hess" conglomerate (which is often not a calcarudite at its base). I suggest the upper dolostone in section 11 is equivalent to the conglomerate.

7/13/57 - Went to El Paso to meet John Pope (Harvard '54) (Mich. 56 MS)  
(Cinci. currently) and his wife.

Charles Marken and Pete Roux left on the 12th for Austin, they were instructors at U.T. field camp, Leary's Ranch.

PG. 101

32

7/16/57

Section 15a - 3/8 miles northeast of road into central valley on Brooks Ranch.  
(10° dip, N60W).

Gaptank?

1) Limestone, dark brown-gray, very fine x-talline, fusulines, some beds gray to gray-tan. This exposure is one of several small isolated rubble heaps out from foot of cliff. This pile of limestone is not bedded, but appears to be more or less



in place. If the fusulines are Gaptank in age then I believe it is safe to consider this outcrop in place. More than 5'. Collection 7/16/57/1 [Leonard Sch. crassitectoria] 1-64 C.R. check sample??

2) Covered 83'.

3) Shale, light gray (impart covered), 7 or 8-2" to 3" sand and silty sand (Quartz) bands scattered in upper half of unit; 28'. 7/16/57/2.

4) Sandstone, orange-brown weathering, medium quartz sand, with silt fragments of pebble (1/4 to 1/2" diameter) Brachiopods, crinoid stems, goniatites wood fragments. 2'.

#### PG. 102

5) Shale, gray to bluish or greenish-gray, 4 or 5-1" very fine sandstone bands, 10'.

6) Sandstone, orange-brown weathering, fine quartz sand size with calcareous cement. A few wood fragments. The lower 1' of this unit is light green-gray weathering, sand size is the same, difference seems to be the amount of Iron Oxide with the CaCO<sub>3</sub> cement. 8'.

7) Shale, greenish-gray, a few 1/2" of sand of siltstone horizon. (7/16/57/3) 27'.

8) Sandstone, orange-brown weathering, very fine sand size much silt --> 30% brachiopods, wood, crinoid stems, 2 to 3" beds 3'.

9) Like 7 in lower part, gradually, upwards, the lithology of unit 8 becomes dominant, beds 3" to 4" is the sandstone: 46'.

10) Sandstone, light brown weathering, (3' of gradational beds at base to this unit into the blue-gray shale at top of #11. 6" to 2' bedding: 19'.

#### PG. 103

{note: illustration:

bed 1: 7/16/57/1

bed 3: 7/16/57/2

bed 7: 7/16/57/3

bed 11: 7/16/57/6

bed 12: 7/16/57/4

bed 14: 7/16/57/5}

11) Covered 23', probably blue-gray shale with possibly one limestone bed 8' uneven nodular bedding surfaces. Fusulines, bryozoan, crinoid hash. Collection 7/16/57/6.

12) Limestone, gray weathering, massive beds, blocks weather rounded, (not angular). This unit has wavy bedding surfaces and seems to represent a fore reef accumulation of dumped debris 6" to 8" beds. 7/16/57/4. 32'.

13) Covered 8' probably same as 12.

14) Limestone, light brown weathering, cliff forms 2' to 15' beds, massive weathering as a unit along most of this ridge. 53' to top of ridge.

#### PG. 104





Section 15b - down dip slope and across draw and up to point which is lithologically similar and on the correct altitude to be bed #14 of Section 15a.

15) Covered 7', gray-green shale for most part.

16) Limestone, gray (light green tint) nodular, wavy bedding 7', 7/16/57/7. The upper 6" to 8" of this unit is now caliche. The caliche becomes less dominant after that. This seems to have been a horizon of higher porosity that either that above or below.

17) Calcarudite, all of about same color, probably biohermal debris deposit - 16' no fossils apparent. 3-5'+ beds - gray weathering, like 12.

18) Covered 10'.

19) Calcareenite + organic fragmental 8" to 3" beds. Crinoid stems and fusulines. 7/16/57/8, 12' weathers pink-brown to reddish brown very uneven bedding.

PG. 105

{note: illustration:

bed 15: 7/16/57/11

bed 16: 7/16/57/7

bed 19: 7/16/57/8

bed 21: 7/16/67/9 and 7/16/57/10}

20) Covered, 16'.

21) "Conglomerate Hess", 7/16/57/9 - a collection of cobbles from lowest exposed bed.

Many shades of Limestone, dark gray or nearly black to light gray, white and black cherts, 7/16/57/10 - fusulines in with the fines of the conglomerate. About 110' thick.

PG. 106

Today picture on page 96 looks like this of we can accept King's age on the #1 bed of my section 10, page 76. {note: illustration on this page}

I believe the Hess Conglomerate is a number of pocket beaches. The dolomite strata probably of Wolfcamp age and exposed to suballuvial weathering.

PG. 107

Section 40

7/17/57

- Allison Ranch Gaptank area -

The manner in which the Gaptank limestone lens is striking. They seem to originate in the "Uddenite" zone and thicken rapidly to the east and then thin to disappearance. I wonder whether this Uddenites zone is even approximately equivalent to that of the "type" area (WCHs)

Section 16, north of highway along Allison-Moore Fence - Due North.

Covered below -



- 1) Limestone, brown-yellow weathering, organic fragmental - Brachs, bryozoans, crinoids, mollusca, fusulines. Collection 7/17/57/1, 5.5'.
- 2) Covered 21'.
- 3) Sandstone, 70% or more Quartz, CaCO<sub>3</sub> cement. Brown-orange weathering, medium (1/8" to 1/4") lamellae, even - not irregular; in beds 3" to 1', some beds are composed of many small shell fragments - I interpret this to be a littoral deposit, has whole shells of punctuate brachs. 7/17/57/2. [12'].

PG. 108

- 4) Covered, (unknown), 2 or 3-6" bands of brown-orange weathering sandstones. Collection 7/17/57/3 from cut hills. 34'.
- 5) Limestone dark gray weathering, organic fragmental crinoids and Brachs mainly. 7/17/57/4 at 38'. 3" to 2' beds 61'. (Transfer bed?)
- 6) Covered, 66'.
- 7) Limestone, dark gray, with large amounts of orange-brown quartz sandstone in between irregular limestone masses. 8', 7/17/57/5.
- 8) Covered, 13'.
- 9) Calcarenite and ss., light gray weathering, dark gray on fresh surface 3.5', 2" to 6" beds - 7/17/57/6.
- 10) Covered 10'.
- 11) Limestone, weathers orange-brown fresh, brown-dark gray. Shell hash, fusulines, crinoids and brachs. 6" to 1' beds. [4'] 7/17/57/7.
- 12) Covered, 13'.

PG. 109

{note: illustration:

bed 9: 7/17/57/6  
 bed 11: 7/17/57/7  
 bed 15: 7/17/57/8  
 bed 16: 7/17/57/12

bed 1: 7/17/57/1  
 bed 3: 7/17/57/2  
 bed 4: 7/17/57/3  
 bed 5: 7/17/57/4  
 bed 7: 7/17/57/5}

- 13) Sandstone - orange-brown weathering, fine sand size, laminated - see color picture. 6"-8".
- 14) Covered, 22'.
- 15) Limestone, medium gray weathering, fine grain Calcarenite, many silicified brachiopods. Collection 7/1/57/8 about 4' above base - crinoids common. 6'.
- 16) Covered, but probably like #15 - 38' to the east becomes a gray-green shale but looks to be more than the measured 38'. 7/17/57/12.

PG. 110



17) Limestone, gray-brown weathering, platy fragments of shells, mostly [potato chip?] brachs, algal. 1' to 2' beds - overall weathering creamy - 7'.

18) Covered 21'.

19) Limestone, (calcarenite) with some quartz 1--20%, cherty or quartzite pebbles 1% or less; weathers a medium brown-gray, whitish speckles - wavy uneven bedding, 1" to 2' thick; 55'. The upper 40' become very quartzite - about 85-90% SiO<sub>2</sub> excluding cement. Becomes poorly cemented upwards.

20) Covered, 45', probably like unit 19, see note on page 112. 8/22/58/7 and 7/17/57/9.

21) Limestone, massive, brownish-gray weathering; [Transfer bed] solutions bedding in 6" to 1' intervals, but not much "true bedding" 31'. Biohermal reef, very light gray on fresh surface, very fine grained, probably mostly recrystallized?

22) Covered, 9'.

23) Limestone, brown-gray weathering, dark gray or fresh surface. Coll. 8/22/58/6.

PG. 111

{note: illustration:

bed 20: 7/17/57/9

bed 21: 7/17/57/10

bed 23: 7/17/57/11}

24) Covered, 20'.

25) Limestone, weathers orange-brown, has brown (Iron stain) chert nodules - 9'.

26) Covered, 36'.

27) Sandstone, quartz grain, medium; Calcareous cement. Brown and green grains, chert and quartzite pebbles (1/4" diameter to 1/2"). Some massive beds, some in 1/4" laminar. 31'.

28) Conglomerate; has some sand in it as 27, just that pebbles become 4" to 8" diameter and up to about 75 to 80% of lithology.

PG. 112

There is almost no limestone in this conglomerate, but it still seems to be the "Hess" conglomerate. In other beds limestone boulders and cobbles are as high as 70%.

#20 In the stream draw, interval 20 is exposed. Calcareous shale and sandstones, rich fusulines free in slope wash. Collection 7/17/57/9. White to light cream weathering. Becomes more Calcareous and grades 2-3' into wavy bedded base to biohermal reef. 35'-40'.

The #4 and #5 limestone of King's Gaptank appear to have beginnings in the "Uddenites" zone just to the west of Gaptank. I find no field evidence which would assign a Wolfcamp age to King's W.C.L.s in this area. It is not until we get above that unit that we find a distinct break in lithology.



PG. 113

7/18/57

East of Texas Highway 51, beds of what I believe are Wolfcampian age (at least lithology) are folded and faulted quite badly. The axis of a syncline strikes N74W from peak of K on NW sides of road up a valley in K on SE side of road.

[Slides read 7-18-57-11.]

7/18/57/1 is from a sandstone in the creek in this syncline. This "syncline" is probably drag resulting from faulting NE of locality 7/18/57/1. 50 yards NE of locality 7/18/57/1, beds are on end; probably another fault, not same one. These structures predate K, although the K is jointed or even faulted (1' through) in this zone of weakness. This little area is very complex - 2 sets of faults; one N74W or so and one N3 to 5°E.

PG. 114

Gaptank locality

Section 17 - This begins in Wolfcamp, concealed fault or faults - Near the base of W.C.. There are

- 1) A number of chert and quartzite pebble conglomerates and quartz sandstone - 8' orange-brown weathering, Chaetetes and tetracoral parts - 8/24/58/1.
- 2) Covered and faulted (probably) distance problematical, +/- 20'.
- 3) Calcarenite, orange-brown weathering, dark gray fresh many fusulines; crinoids, very fine ss matrix. (Collection 7/18/57/2 coarse in slope) 4" to 2' beds, shale partings; 9'.
- 4) Covered 33', passed one upturned outcrop - marks N74-75°W fault of about 10' throw, south west side up: at 63' the outcrops strikes nearly north south - apparent cut by a fault in that direction, east side. [faults add about 30' to this interval better exposed north of old road].
- 5) Calcarenite, orange-brown weathering, shell hash 1.5'.
- 6) Mostly covered - a 6" unit like 5 seems to crop out in middle of unit. [5'].

PG. 115

{note: illustration:

bed 2: 7/18/57/2

bed 5: 7/18/57/3

bed 7: 7/18/57/4}

- 7) like unit 5, in 3" to 8" beds, 4'. The back of this unit has been faulted off.
  - 8) To the best of my ability I believe I found the same beds as 5, 6, and 7, covered for 13', then
  - 9) Calcarenites, orange weathering with an increasing % of quartz sand, upward; Interbeds of conglomerate quartzite and cherts common but with some limestone, many beds are dominantly limestone 24' - upper part dominantly conglomerate - lower part ss.
  - 10) Covered probably the same as 9.
- Collection 7/18/57/5 - P.King Chaetetes limestone at base of Gaptank along old road. (N dip of anticline is type area).





PG. 116

The Kings did not recognize the complicated structure of the Gap Tank area. I believe this #4 and #5 Gaptank limestone are the same bed, faulted into 2 portions. The N75-74°W faults do this, and the N-S faults tend to make the units appear thicker than they are normally.

The conglomerate in the eastern most "upper" Wolfcamp contains Tenus (+- Haymond) and Dimple, the Dimple in very dark limestone, the Tenus and Haymond are quartzite.

The massive limestone member of the Wolfcamp seems to grade laterally into bed 3, section 17, but faulting may make the picture more complicated.

Fossils look like the only answer to the question of just were to place there "upper" Wolfcamp beds in Section 17. The conglomerate would suggest it should all be called Hess, but the lithology is similar to the upper Wolfcamp. The fossils suggest an environment similar to the Uddenites interval. These beds are slightly more coarse than the type section of Wolfcamp, but

PG. 117

we are about 12 miles? away too - There is no typical conglomerate of the Hess before we get into the silty quartz Hess beds here. Problems!

It will pay to investigate the outcrops in the Canyon south of the Allison Ranch. The "Wolfcamp" may be exposed there, but I really wonder!

PG. 118

7/19/57

Mr. Moore wasn't at home (Ranch); lives in Midland.

Decie Ranch

The conglomerate lithology C.O.D. pointed out as Wolfcamp pinch the shale interval out to the southwest. The biohermal horizons Jarvey mentioned near the road, I believe are southwest extensions of the lower Hess ledge. The lower Hess ledge 1/2 mile northeast of the first stop contain "Wolfcamp" lith conglomerate high into the unit. The lower Hess ledge is in beds of 1' to 3' limestone at this southwest locality but the lower beds become massive to the northeast and the upper limestone of this interval gradual thin out within 1.5 miles to the northeast. The conglomerates below look like those {note: illustration followed} within the Hess (lower) ledge. At this southwest locality I believe Jarvis has mistaken the upper Hess ledge for the lower Hess ledge.

PG. 119

Collection 7/19/57/1 - a limestone cobble in the Wolfcamp conglomerate. From a free back, but apparently from lower 1/2 of exposed conglomerate section about halfway between Wind Mill and stop 1.

PG. 120

7/20/57



Decie Ranch southwest end of Lenox hills.

Section 18 -

- 1) Conglomerate, base of unit concealed. Has a lot of Haymond type pebbles, gray sand matrix, a rather small amount of CaCO<sub>3</sub> cement. Not knowing if the dip here is significant, I will level up through the conglomerate beds. This unit is in part covered, but the conglomerates are coarse and are the only outcropping rocks - 55', Cobbles of Conglomerate - Collection 7/20/57/10.
- 2) Limestone, gray calcarenite, same minor amounts of fragmental cherts, dip about 10° WNW zones within this limestone unit are quite conglomeratic. The chief distinction between this and #2 is limestone sands make up the matrix. The conglomerates peter out in about 7', but very fine pebbles are present in the limestone higher in this unit. Top of unit is very siliceous, well sorted, forms a 1" plate. Bedding below is 1' to 4'; 52'. This unit I believe equal to Lower Hess Ledge.
- 3) Covered 4'.

PG. 121

{note: illustration:

bed 1: 7/20/57/10

bed 4: 7/20/57/1

bed 9: 7/20/57/9}

- 4) Siltstones and very fine sandstone - siliceous cement laminar but often irregular texture; siliceous cement is secondary see 7/20/57/1, 11'.
- 5) Limestone, clastic, with chert pebble 1', thin to northeast thickens to southwest.
- 6) Like #4, 5'.
- 7) Like #5, 1.5', thicker to southwest.
- 8) Like #4, 6'.
- 9) Limestone, clastic, 3 beds 4" to 8" thick, each with well sorted flat tops, separated by siltstones; 3'. 7/20/57/9.

PG. 122

- 10) Covered 3'.
- 11) Limestone, conglomerate, chert and quartzite large pebbles; limestone clastic sand size matrix. 1' to 2' beds; Top is same old flat surface, well sorted, and silicified 1/2" to 1".
- 12) Covered, 24', probably clastic limestone and conglomerate.
- 13) Limestone, organic frag., bryozoans, crinoid (stems) brachiopods; 7/20/57/2; 1.5'.
- 14) Covered, 5'.
- 15) Limestone, organic frag. 7/20/57/3, rubbly at base, becoming well sorted in upper 6", top 1" is silicified and laminated, top is flat. 2.5'.
- 16) Covered 5'.
- 17) Limestone, organic frag and clastic, some small chert granules - a fusuline or so, echinoid spine [2'].
- 18) 17' covered.



PG. 123

{note: illustration:

bed 13: 7/20/57/2

bed 15: 7/20/57/3

bed 21: 7/20/57/4; 7/20/57/8}

19) Limestone fragmental (organic) and quartz fine sand, crinoid frags and brach shells, become more sandy upwards. 9'.

20) Covered - 6'.

21) Limestone, clastic, gray weathering like the other lower clastic limestone, has flat top with 1" siliceous zone 8" to 1', 7/20/57/4, 5 repeats of this lower lowest lithology (at least) in 8" to 3' beds; 18' near top some chert chips. 7/20/57/8.

22) Sandstone, very fine size, weathers light brown thin but uneven laminae. With 2, 3" limestone of the #21 type. 9'.

PG. 124

23) Limestone, clastic and organic frag. gray weathering with a tinge of brown. 2 cyclic beds one (a) 3'; (b) about 4'. Collection 7/20/57/5. Flat tops are silicified and weather a brown Iron oxide color. 7'.

24) Covered, 14'.

25) Limestone, calcarenite, both clastic and organic frags, weather light gray-brown. 1' to 2' beds. 12'.

26) Covered, 31', probably light brown very fine sandstone or siltstone.

27) Marl? This unit is worth additional study. Massive Rx, no bed except near top in a irregular surface. 2 shades of silty limestone; one light brown one light gray - they occur interlocked with each other - also coarse sand size chert and limestone fragments are twisted and warped through this bed. Several kinds of brach shells, bryozoans, and fusulines. I believe this is a bed of slumped material.

PG. 125

{note: illustration:

bed 23: (a) and (b) 7/20/57/5}

on over steepened Permian near shore deposit, a 3" diameter pebble is starring at me. 1.5'.

28) 7', light brown weathering, very fine sandstone.

29) Limestone, gray (dark) clastic, some 1/4" diameter chert and quartzite, 1/2" red-brown siliceous upper surface. 6".

30) Like #28, 8'.

31) Limestone, light brown to gray-brown weathering; very silty and very fine sand size - an irregular 3" band of very fine pebble. 1/2'.

32) Covered, 13', probably like #28.

PG. 126



- 33) Siltstone, very limy, light brown to brown-gray weathering.
- 34) Sandstone and siltstone, sandstones very fine grained grades into a 1' to 1.5' lime rich resistant beds. [8'].
- 35) Sandstone, very fine grained, light brown weathering up to 1" bedding - 23'.
- 36) Covered, 5'.
- 37) Sand as #35 - 8'.
- 38) Limestone, gray weathering 8", has a little cephalopod in it. 7/20/57/6.
- 39) Sandstone, very fine grained, light brown weathering 8'.
- 40) Limestone, Massive, gray weathering, biohermal, Upper Hess Ledge.

PG. 127

{note: illustration:

bed 38: 7/20/57/6

bed 40: 7/20/57/7}

Collection 7/20/57/7 - a piece of float, found at about bed 34 - it is a gray limestone so is either from about #38 or, most likely from #40.

Upperpart, through bed 29, of this section the sequence of lithology is rather cyclic, even the Hess (?) in it upper part shows cyclic deposition but with the change of either source of sediment or of depositional environment. I frankly don't know exactly where to draw the Wolfcamp Conglomerate, the bed #2 limestone I believe is equal to the lower Hess ledge. King calls the lower limestone ledge Hess, and the upper ledge, the first Leonard limestone member. Section 18 thus includes Wolfcamp (part), Hess, and lower Leonard brachs.

PG. 128

7/21/57

Section 19 - up to eastern most cliff forming Wolfcamp Conglomerate - topped by Hess limestone ledge. Decie Ranch.

The lower part of this section is covered and it is jumbled up.

no dip

0) Covered below

1) Sandstones, green-gray weathering, much green silty material, 6", Collection 7/21/57/1.

2) Conglomerate, brown weathering, mostly 1/4" to 1/2" chert pebbles, brown sand, but few crinoid stem fragments, 5', 7/21/57/2; 2" to 6" beds.

3) Covered, 10'.

4) Limestone, medium gray weathering, biohermal, no definite bedding, large cephalopods, crinoid columns, fusuline (very large for Penn., could they be Pm?) brachiopods - 29'.

Collection 7/21/57/3.

(Rained out) {note: illustration:

bed 1: 7/21/57/1

bed 2: 7/21/57/2

bed 4: 7/21/57/3; 7/29/58/1; 7/22/57/1}





PG. 129

7/22/57

5) Limestone, with 30-40% chert (and quartzite) pebbles - gray to gray-brown weathering; a few limestone pebbles. 3' beds, from about middle of unit upwards, large limestone cobbles appear, a few horizons are nearly sandy (coarse); 46'. It should be noted that the upper 2/3 of this unit could probably best be called a conglomerate. The limestone is nearly completely lacking except as cobbles in the upper half. About 5% or less of the upper rock unit is limestone cement.

6) Covered for most part, exposures are conglomerate, chert and quartzite, limestone cement. One big limestone block at 38' (Collection 7/22/57/2) 145' - I'm separating this as a unit only because of the weathering characteristics.

7) Conglomerate, poorly sorted to no sorting, chert, quartzite, limestone pebbles; some small cobbles - lime cement. Mass, cliff forming. Become coarser (small to medium boulders) upwards. 84', 1' to 20' beds.

8) Covered - 65' this is probably the extension to the west of the green-gray shale and calcarenite tongue.

PG. 130

9) Conglomerate, brown and gray weathering. Limestone, chert and quartzite pebbles, brown sands, not sorted; base is covered. 3' or more (7/22/57/3).

10) Calcarenite, dark brown weathering. Zones of pebble (10%) in calcarenite. 2" to 2' beds very irregular channelling in top of bed 10. 22'; has a flat top, siliceous clastics are dominant.

11) Conglomerate, chert, quartzite and limestone; limestone locally dominates to make this a calcarenite but chert and quartzite dominate elsewhere (with 5' horizontally). (7/22/57/4) 35' up predominantly limestone in the upper 10' (>50%) has brachs, bryozoans, crinoid stems and coral, besides the fusulines. I think it could be called near biohermal both in formation and position during Pm. 49'. Brown and dark to medium gray weathering. Has blocks and small lenses of light brown silty which weathers out leaving vuggy appearance.

PG. 131

{note: illustration:

bed 6: 7/22/57/2

bed 9: 7/22/57/3

bed 11: 7/22/57/4; 7/22/57/5

bed 12: 7/22/57/6

bed 19: 7/22/57/7

bed 21: 7/22/57/9

bed 24: 7/22/57/8}

12) Calcarenite, medium gray weathering; has granule size organic fragments, 6'. Collection 7/22/57/6, 2' beds.

13) Partly covered - apparently alterations of brown silt and sandstone and calcarenites. 3 cycles - 6'; 6" to 1' limestone.



Calcarenites in 12 and 13 have flat top brown siliceous stained.

PG. 132

14) Conglomerate, about 6" grading up into a rubble of algal, sponge, a few fusulines which may have been transported, crinoid stems, 6'.

15) Sandstone, light brown 1/16" to 1/2" beds - 7'.

16) Limestone, calcarenite, with organic frag. granule size, 1'.

17) Sandstone brown - 6".

note: here the calcarenite is irregular at its base and rests on eroded and weathered brown sandstone - (apparently the major break in sedimentation?)

18) Like #16, 2'.

19) Limestone, biohermal, gray weathering with brown conglomerate chert pebbles.

7/22/57/7, 6' becomes a calcarenite at the top (2') and a flat top surface with siliceous iron (brown) weathering.

PG. 133

20) Sandstone, brown, like #15 - 4.5'.

21) Limestone, rubble, with chert conglomerate and limestone conglomerate cobbles: grades into a calcarenite (upper 6" to 1') with a flat, siliceous iron stained upper surface. Collection 7/22/57/9, 7.5'.

22) Sandstone, light brown weathering, much coarse calcite sand with the fine quartz sand. 2'.

23) Limestone, massive, brownish-gray weathering chert pebbles, and limestone boulders scattered in this. 15'.

24) Limestone, mostly calcarenite - 4 cycles of rubble through calcarenite to flat top with siliceous Iron stained; 21'; (at top 7/22/57/8) top of ridge.

50' northeast of measured section a chert and quartzite conglomerate has cut a 8' channel in unit #25. This conglomerate appears very much like unit 8 (in the lower part).

PG. 134

The conglomerate intervals 1 through 8, thicken northeast ward toward the old Decie dry hole. This is accomplished by a slight thickening of individual beds in that direction, but also by off lap in what are apparently large channel bedding. {note: illustration followed}

PG. 135

Section 8 -

Wolfcamp over lies Gaptank angular unconformity. Gaptank strike N75W dip 9° NE.

Collection 7/22/57/10 and 7/22/57/11 in Gaptank at this point.

1) Limestone yellow weathering, yellow is from a high % of silt, shot through with Calcite veins 7/22/57/10; 30'; covered below.



- 2) Limestone, biohermal, dark gray to medium brown, yellow weathering silts, chert pebbles and limestone cobbles, 2 beds, 14' (Collection 7/22/57/11).
- 3) Conglomerate, brown weathering. Cherts, quartzite and gray limestone, brown sand; This unit laps up side of high (top) in #2 bed and finally covers over the top. Strike N30E, dip NW11°, 29'. {note: illustration followed}

PG. 136

- 4) Sandstone, brown to gray, siliceous weathers purples, magentas and orange locally, 14'.
- 5) Conglomerate, brown weathering; has sand of #4, cherts and quartzite (but little or no limestone) medium pebbles; has the dark weather colors of #4 - secondary! replacement, 6" to 4' beds. 74'. Moved SW along bed 5 - 100 yards, to a point opposite creek bed.
- 6) Sandstone, yellow to yellow brown weathering, 1" to 3" beds, a lot of silt and fine to very fine sand size; quartz, poorly cemented. 6'.
- 7) Conglomerate, pebbles of chert, quartzite and limestone; light gray-brown sand matrix. 4'.
- 8) Shale, brown, some gray-blues; a 5" brown weathering sandstone top, total 6'. Collection 7/22/57/12.
- 9) Conglomerate like 7, 2.5', with 2 interbeds of #8.
- 10) like #8 with 2 - 3" to 4" conglomerate beds like 7 [8].

PG. 137

- 11) Conglomerate, pebbles of chert, quartzite; brown sand matrix; weathers brown to brown-gray, 2 beds, one 2' massive, upper one is 1' flat top of fine sands, 3'. (continued on pg. 143)

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7/25/57 - Van Horn area, Eagle Mts, east side.

Collection 7/25/57/1 - shale zone in Hueco - about lower 1/4 of outcrop - This is James Underwood's Thesis area.

7/25/57/2 Wolfcamp? (Sample 7/25/57/2 of James Underwood U of T). NE end of Wolfcamp hill NE of Eagle Springs Ranch House - was base of hill massive, dark gray limestone.

7.25.57.3 (4 to 6' above 7/25/57/2)

The Hueco? is exposed in several localities here: a) In Page Twiss' area in the Van Horn Mts. the Hueco is a dark dolomite in its entire sequence above the PowWow Conglomerate - 800 to 900 feet. b) In the Eagle Mts. James Underwood's area the Hueco becomes sandy in the lower and upper parts - same dark gray limestone (dolo?) in the middle, 600'?

PG. 138

The Hueco exposed in Page Twiss' area is a dark fetid dolostone; Echinoid spines and some products of brachs are silicified prior to dolomitization, but nearly all other fossils have been dolomitized and either completely lost or lack any structures; just outlines. In the Van Horn Mts. there is about 800-900' of Hueco -



about 40-50' of PowWow Conglomerate and transition zones. It is similar to the basal conglomerate of the Wolfcamp and contains siltstones and sandstone possible of the equivalent to the Uddenites zone, but not the same facies. In James Underwood's area the Hueco is about 600-700' in the eastern locality (7/25/57/1) and perhaps thicker in the NE locality (7/25/57/2 & 7/25/57/3). These last 2 localities are near the base of the unit but the exact horizon was not determined. There is some structure complications in this area and so more detailed work is needed. The presence of siltstones, shales and sandstones in the first locality suggest the lower 1/3 and upper 1/3 are not normal deep basin deposits like the middle 1/3 but (continued on pg. 139)

PG. 139

7/26/57

Collection 7/26/57/1 from base unit of Igneous rock - above Boquillas limestone (K) - This is a possible freshwater limestone in prevolcanic time. Black Peak east of Wylie Mt.

Collection 7/26/57/2 - South of Van Horn about 15; The 3 sisters, western most peak

{note: illustration:

bed 1: Trachycite

bed 2: 200'; water bedded tuffs

bed 3: 10'; Trachycite

bed 4: 10'; Calcium rich and tuffs; 7/26/57/2

bed 5: Trachycite}

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cont'd from (pg. 138)

but rather are near the margin of the basin, probably the SW side. I've promised Jim to let him know what fusulines are from the second and third localities. In general a measured section in this larger region seems to promise little in the way of fusulines. See: Baker, U of Tex, Bull. 2745 (?). Gielerman, 1953, U.S.G.S.B. 987.

PG. 140

7/27/57

Wolfcamp Hills - showed C. Ellis around area.

Collection 7/27/57/1 - Uddenites zones west side geologist's Canyon in saddle.

Collection 7/27/57/2 - Float, near bed #22, section 4, see page 35.

Collection 7/27/57/3 - see page 52; bed 15, section 6.

Collection 7/27/57/4 - Uddenites zone (biohermal locality) NE of Windmill on main reef.

James Robert (Robby) Moore III, Tex. Co. Research Lab, Houston, Tex. mentioned many of the oil company fellow find the Hess in the western (Lenox) part is equivalent in age to the Wolfcamp in the type area and eastward. Also





that the brachiopods and the fusulines may indicate different ages in comparison to other areas.

Robby gave me a couple of samples from near Shafter, Tex. He believed of Pm. age. They contain orbituloida and couple of Mollusca of undoubted Upper K age, probably Georgetown.

PG. 141

My theory on the cyclic bedding in the upper Wolfcamp is as follows at the present time:

- 1) Downwarp of Wolfcampian basin to north Deposition of gray and tan shales and a few siltstones gradually filling edge of basin, but beyond "reef" facies.
  - 2) Biohermal activity encroached on this more or less flat bottom "mud" flat from reef (to south) in a northward direction. This accumulating until wave action takes over control.
  - 3) The wave action sorts and worked the later deposits of the biohermal deposits to reduce grain size, increase relative % of quartz and form laminar bedding in upper inch or so. Bypass was important and represents a considerable time of a lost record. Repeat back to condition 1. {note: illustration followed}.
- There is more to this than just this simple diagram. The east west facies change leave room for more questions than I have answers at this time.

PG. 142

7/28/57

trip to Big Bend Park.

Collection 7/28/57/1 - 27 m south of Marathon - Glenn Rose upper marl zone; *Orbitolina texana*.

7/30/57

Collection 7/30/57/1 - light gray shale beneath freshwater limestone in spur between Calamity and Sheep Cks about 26 miles south of Alpine. See ref. Goldich and Elms (CI of Tex. Bull?)- They assign Eocene age to this limestone in Pueth tuff sequence. Stop 14 Big Bend Guide Book. Collection 7/30/57/2 - limestone part of freshwater sequence above.

PG. 143

7/31/57

Section 8 (cont) - dip 10°NW.

- 11) Covered 30', probably gray-brown shale for most part.
  - 12) Calcarene, greenish and orange-brown weathering, poorly sorted at base, includes dark "light-colored" cherts; very fine green quartz sand, Brach, Crinoid and fusuline frag. The lower part is near a granular or fine pebble conglomerate. Upper 4" becomes well sorted.
- Collection 7/31/57. Wood frags. common, bryozoans common. Slightly undulate upper smooth surface (3.5').
- 13) Covered, 13', probably gray shale.
  - 14) Gray shale, with brown tinge. Collection 7/31/57/2; 5'.



- 15) Calcarenite, like #12, but conglomerate pebbles larger, 4.5', becomes better sorted (Collection 7/31/57/3) and finer in upper 4" to 5" flat to surface.  
16) Covered 11', probably mostly gray shale.

PG. 144

- 17) Calcarenite, yellow-brown weathering, because well cemented and with siliceous pebbles in upper 5", 1.5', Collection 7/31/57/4 from #17 and loose stuff, probably from shale just above and just below #17.  
18) Shale, gray to gray-brown, slightly silty 12'.  
19) Calcarenite, yellow-brown weathering; lower 8" are pebbly conglomerate a 1/2" shale break and the upper 4" to 5" are well sorted, evenly laminated quartz sand and calcite sand, fine size. Flat top with an Fe<sup>3+</sup> oxide zone of very fine sand sizes. 1'.  
20) Shale, brown-gray, 28'. Near top Collection 7/31/57/7. Near base Collection 7/31/57/8.  
21) Covered, probably like #20, may have several calcarenite (gray), beds. 26'.  
22) Limestone medium gray, with a large % (25-30%) Cobble conglomerate. This might be best called a conglomerate with limestone cement locally. Beds are 2.5' to 5' thick; 18'. Collection 7/31/57/5.

PG. 145

- 23) Covered 5', less resistant zone of limestone rubble? or finer sand?  
24) Limestone, massive, locally conglomerate (quartzite, limestone and chert) medium gray weathering (see 6/24/57/2); upper 3"-4" bed is fine grained, flat topped. 25' Biohermal "Hess limestone" of King. Collection 7/31/57/10..  
25) Limestone, rubble, some conglomerate cobbles - lenses of 6" to 3' beds - contains biohermal junk crinoids, bryozoans, large fusulines, brach. Collection 7/31/57/6, 3'-5'. This unit thickens to about 8' to the SW just above the Kinkajew dens - (about 200').

Section 20 continued about 200' to SW above Kinkajew dens - followed at top of bed #24.

- 25b) Sandstones, light brown-gray grading up into a conglomerate and organic frag. hash. Has a well defined planar top with Iron stains and cement. Tetracorals common, also Productid shell frags.; 8'.

PG. 146

7/31/57 & 8/1/57

- 26) Covered, 15', one 8" bed of siliceous pebble conglomerate exposed in middle of unit, rest is probably gray shale (?).  
27) A series of orange-brown weathering, fine pebble conglomerate, from unsorted at base to well sorted at top, with flat upper surfaces - upper 2" are well cemented with SiO<sub>2</sub>. Collection 7/31/57/9 at base. Several beds of siliceous very fine sandstone or siltstone, 10'.  
28) Shale, dark gray-brown, 3'. Collection 8/1/57/7.



- 29) Calcarenite, orange-brown, organic frag.; very fine pebble size; crinoid stems, echinoid spines. 6".
- 30) Shale, medium gray-brown. 2.5'.
- 31) like the beds in #27 - crinoids and fusulines. 6"-1'.
- 32) Shale, dark gray, 16'.
- 33) Calcarenite (with high % of chert pebbles too) grading upwards through calcarenite to quartz sandstone with iron oxide cement. Weathers - Pale yellow-brown to a deep orange-brown at top.

PG. 147

- 34) Sandstone, weathers light tan to buff. Grades into a siltstone and then into a shale. The fresher shale is dark gray. 9'.
- 35) Covered 12', probably mostly dark gray shale.
- 36) Shale, dark gray; and siltstone, weathers light yellow-brown. These two lithologies grade back and forth horizontally as well as vertically, 16'. Collection 8/1/57/6.
- 37) Calcarenite; dark gray (fetid); weathers a medium yellow-brown. Full of fusulines. Collection 6/24/57/7, 1.5'. Surface silicification of fossils; also the upper surface is flat, well sorted, laminar fine calcarenite with siliceous zones.
- 38) Siltstone, light yellow-brown weathering; with lenses of calcarenite; rather well sorted but not laminated. 9.5'.
- 39) Covered. 18'. Collection 8/1/57/5 from a poorly exposed bed in middle - like #40.

PG. 148

- 40) Calcarenite, light gray-yellow, darker frags of fusulines, algal masses and other fossils. Irregular lenses of tan siltstone in various attitudes to bedding - 3'. 8/1/57/4.
- 41) Siltstone, finely laminated, yellow light brown weathering. Grades upward into dark gray shales; 29'.
- 42) Calcarenite; organic frag; brachs, bryozoans, crinoid stems; echinoid spines; fusulines. 1'. 7/26/58/7.
- 43) Shale and siltstone; some mudstone, weathers tan (light yellow-brown); dark gray on fresh surface. 42'.
- 44) Sandstone, light brown weathering, mud gray-brown on fresh surface. Has fossil frags in lower part very silty in upper part. 1'.
- 45) Shale and siltstones, light yellow-brown to medium gray weathering. In upper 2', lenses of organic fragmental limestone appear. 29'.

PG. 149

- 46) edgewise conglomerate? Limestone, organic frag., medium gray weathering; tetracorals large crinoid stems, brachs, bryozoans. Bottom is irregular, seems to follow cut or eroded top of #45. The top of #46 is smoothly undulatory, siliceous upper 2". 8" to 1' (shows siltstone conglomerate toward drainage).



- 47) Sandstone, very fine quartz, very silty; light gray-brown weathering, no apparent bedding irregular blotches of varying shades of color. 0-1'.
- 48) Collection 8/1/57/2. Siltstone, light gray-brown weathering, rests on irregular top of #48, in one location rests directly on #47. Fills the trough so formed evenly and within 1.5' is evenly bedded. 14'.
- 49) Collection 8/1/57/1. Calcarenite, very fine grained; weathers light bluish-gray. Rich in brownish silt. Has a small coiled cephalopod fauna, see bed 38, sect 17. 2'. (a unit like #51 between the 2 limestone beds of this unit).
- 50) Covered, 9', probably similar to #49. Light brown, sandstone very silty, poorly cemented.
- 51) Calcarudite and chert quartzite conglomerate with one or two siltstone beds. 8' light gray weathering except for cherts and quartzite pebbles, some limestone cobbles medium gray.

PG. 150

- 52) Limestone, organic frag.; light gray weathering Productids, crinoid columns; upper 2" rich in siliceous cement and fossils. 2.5'.
- 53) Alternation of limestones like #52 and siltstones like #45, at least 4 alternative interval is poorly exposed; siltstones have siliceous bands. 12'.
- 54) Calcarudite, cobbles 3" to 6" diameter; about 5% or less siliceous rocks in this unit. 8'. This seems to form the base of King's 1st Basal Leonard limestone. 8/1/57/3, float found near bed 43. I believe it has come down from either bed 50 or in the Leonard above.
- 8/1/57/10 - NE of Section 20, 200 yards, from bed #24 - one light colored black, grayer ones are in matrix of rock.

PG. 151

Afternoon (8/1/57) walked along Wolfcamp interval to the NE about 1 mile. The upper shale of the Wolfcamp is poorly exposed along here and even the basal conglomerate of the Wolfcamp is incompletely exposed.

The Dimple is exposed in a window (?) in the Dugout Ck Thrust sheet. Dimple is the apparent source for much of the lower Wolfcamp conglomerate at this point.

Collection 8/1/57/8. Haymond? is exposed just to the SW of the Dimple;

(8/1/57/9) is from sand and siltstone in Haymond. {note: illustration followed}

PG. 152

Collection 8/1/57/11 - This bed is dipping slightly toward the town of Marathon, not a good exposure, but believe this is Gaptank thrust over Haymond onto Dimple.

The diagram on page 151 shows 2 limestones thickening and thinning. This is really caused by a fault - raising the NE side about 60-70' with respect to the SW side. The thickening and thinning of the Hess limestone I'm sure does take places but perhaps not on the order of magnitude pictured on page 151.

The Sullivan Canyon fault cuts the NE end of the Decie (Lenox) Hills. The lower Leonard limestone is dropped on the NE side to a point below the Hess sacchinella reef. The picture is confused by several twisted or rotated fault





blocks, in parallel to main fault system. Just SW of Windmill, in line with the Sullivan Canyon fault, there is evidence of a fault - the NE side has black chert (Tenus or Dimple?) faulted against Wolfcamp? or Gaptank orange-brown sandstone.

PG. 153

The amount of cover NE of the place section 20 was measured obscured the geologic relationships. I believe the conglomerate of the lower Wolfcamp is missing in part and pinches out completely over a couple of Haymond and Dimple (Wolfcampian) hills. The evidence is negative because what I believe is Gaptank sandstone (orange-brown) has no conglomerate cover. The Haymond clays and sandstones are exposed very close to the Hess sacchinella reef and no conglomerate is exposed typical of the lower Wolfcamp.

These faults according to P.King's map line up fairly well with the 3 that flank the north end of Cathedral Mt. He maps the black chert as Ord. Marathon "V" unit. The orange-brown beds as Gaptank. They look much like some of the biohermal masses in the Uddenites zone, however. The Dimples cherts are present in great abundance in the conglomerate (see sample 8/1/57/8) which may represent the lower or basal portion of the Wolfcamp.

PG. 154

Lenox Hills near Sullivan Ranch Road.

P.King has mapped the Hess as being faulted about 50-75' down to NE with one fault. I believe there are several smaller faults parallel to the main one. I will sample from the section below the NE nob, but I believe the Leonard is faulted below the Hess at this point and the Leonard cliff forming limestone caps it. G.A. Cooper in the West Texas Permian guide books, 1957 mentions that it seems to be Leonard.

PG. 155

8/2/57

Section 9

Section 21 - Sullivan Ranch Road at NE end of Lenox Hills. P.King called this interval Wolfcamp, I believe it is probably Hess. 0° dip for measurement.

1) Limestone, medium gray, more or less massive, forms lowest part of slope - 8/2/57/1. The lower 5' of this unit contains chert pebbles (fine) in well defined bedding band. Dev. and Ord. cherts. Upper 1' is orange-brown well sorted; total 34'.

2) Covered, 34'; patches of light brown siltstone and sandstone crop out here and there in this interval but no definite relationships were determined. In the upper 15' several biohermal rubble limestone appear to be present.

3) Medium to dark gray calcarenite; well sorted, upper 1/2" is dark siliceous rich. 1'.

4) Shale and siltstone, light brown 1'.

5) Limestone, gray with a tinge of brown. Biohermal rubble - Crinoid columns 2" or more diameter. 3" to 2' beds - total 3.5'.



PG. 156

- 6) Covered, 7' probably mostly light brown shales and siltstones.
- 7) Calcarenite, medium gray to orange-brown. A few small pebbles near base, grades into fine sand near top. Upper 1" to 2" siliceous ferric rich.
- 8) Covered, 25', this seems to be light brown shale for most part, some siltstones and some very fine sandstones.
- 9) Limestone, organic frag.; some black chert (Ord?) Crinoid columns, bryozoans and fusulines. 1' to 1.5'. 8/2/57/2.
- 10) Shale, siltstone and very fine sandstones; light brown weathering. 17'.
- 11) Covered, 27'.
- 12) Massive limestone, light gray to light tan weathering. Lower 6'-10' have large limestone cobbles, small amount of fine chert pebbles. Collection 8/2/57/3. 58'. This unit has been dolomitized top of NE most knoll.

PG. 157

Section 22 - NE of Sullivan Ranch Road. Starts between 2 windmills. Gaptank below is badly folded and faulted, chert conglomerate, breccia in the greenish chert, beds of chert below seem well bedded and not excessively broken - Gaptank limestone is present as well as brown sandstones.

- 1) Conglomerate, much chert pebbles and limestone cobbles. Brown cement or matrix dip is about 15° due N. 20'. Becomes fine upwards, some organic fragmental material comes in. 2'-3' beds. 8/2/57/4.
- 2) Limestone, medium gray, mostly organic frags., some small chert pebbles. Crinoid stems dominant. Has brownish hue (weathered), Collection 8/2/57/5 about 20' up from base. Collection 8/2/57/6 about 60' up from base - thickness - 78'+ the upper beds dip south about 46 to 60°, I suspect this unit is faulted Leonard, a thin bit of upper Hess is #1 and no lower Hess or Wolfcamp at all. Leonard or Upper Hess resting on Dimple, Haymond Tenus and Cabaous.

PG. 158

In walking over this outcrop as far as the Decie fence line there seems to be no exposure of Pm rocks older than these in section 22. The green-brown silty sands (Haymond?) is in a very tight syncline or overturned anticline which strikes near E-W paralleled with the fault in the Leonard. I believe the displaced rocks are faulted down because I can trace this structure about a quarter of a mile. The Cabonferious breccia zone is quite thick here (40-50') and has an upper surface which appears wave cut. It dips steeply to the N (as much as 55°). This surface has since been distorted and is now cut by many secondary faults. The complete field relationships of these beds are unfortunately concealed. Collection 8/2/57/7 - Blue shale 20' interval below Hess limestone ledge, N45°W of Decie well now windmill.

PG. 159

Collection 8/2/57/8 - Biohermal or Biostromal zone in base of Wolfcamp Conglomerate (G.A. Cooper locality) almost due west of Decie well-windmill.



It would be nice to check the outcrops on the Iron Mt. Ranch that P.King mapped as Wolfcamp. The Leonard Mt. section will have to suffice. Why should P.King have missed this important structure by the Sullivan Ranch Road? Probably didn't walk over it (?).

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8/3/57

Shipped 138# of rock specimens in 3 sacks, the heavier two were double gunny sacks.

END OF BOOK ONE 1957